Iowa-Cedar Rivers Basin Study

U.S. DEPARTMENT OF AGRICULTURE
Forest Service
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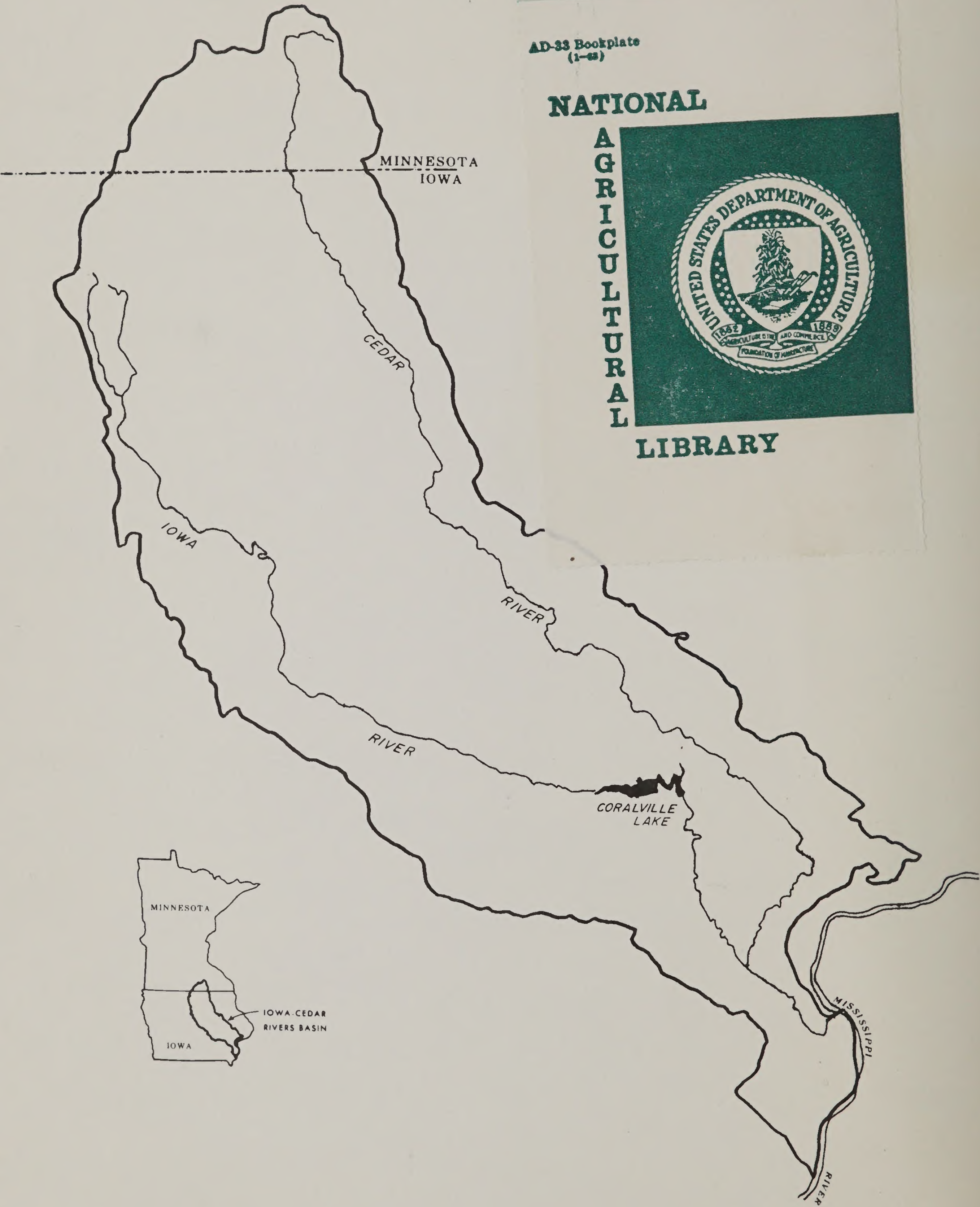
MINNESOTA
IOWA
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CORALVILLE
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MINNESOTA
IOWA-CEDAR
RIVERS BASIN
IOWA
MISSISSIPPI
RIVER

IOWA-CEDAR RIVERS BASIN

IOWA-MINNESOTA

A WATER AND RELATED LAND RESOURCES STUDY OF THE IOWA-CEDAR RIVERS BASIN IN IOWA AND MINNESOTA

PREPARED BY

ECONOMIC RESEARCH SERVICE

FOREST SERVICE

SOIL CONSERVATION SERVICE

IN COOPERATION WITH

IOWA DEPARTMENT OF SOIL CONSERVATION

IOWA CONSERVATION COMMISSION

IOWA-CEDAR RIVER CONSERVANCY DISTRICT

MINNESOTA SOIL AND WATER CONSERVATION COMMISSION

UNDER DIRECTION OF

USDA FIELD ADVISORY COMMITTEE

DES MOINES, IOWA

1976

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SUMMARY

OBJECTIVE AND SCOPE OF STUDY

The primary objective of the U. S. Department of Agriculture's participation in the Iowa-Cedar Rivers Basin Study was to develop a plan that will facilitate the coordinated and orderly conservation, development, utilization and management of water, land and related resources. The study identifies the opportunities to promote economic growth and development. This growth and development can provide long-term benefits to the residents of the Basin, State, Region, and Nation. The study also seeks alternatives to develop and improve the environmental quality of the Basin's land and water resources.

The study includes the identification and evaluation of potential project type developments which should be initiated or accelerated during the next 10 to 15 year period. Emphasis was given to those projects and measures which can be implemented through USDA programs. This report includes an appraisal of the overall water and related land resource problems, needs, and estimates of potential of these resources for the years 1980, 2000, and 2020.

SIZE AND LOCATION OF BASIN

The drainage area of the Basin is 12,970 square miles or 8.3 million acres. Of this, 92 percent, is located in all or parts of 35 counties in Iowa and the remaining 8 percent is in all or parts of four counties in Minnesota.

The Iowa-Cedar Rivers Basin beginning in south central Minnesota extends across east-central Iowa and flows southeasterly to the Mississippi River. It is bounded by the Wapsipinicon River Basin on the east and by the Des Moines and Skunk River Basins on the west.

Also included are all the intermediate areas lying between the mouth of the Iowa River and the mouth of the Skunk River, to south, which drains into the Mississippi River directly or through their tributaries. The latter area includes the Flint River and Spring Creek.

The Iowa River portion of the Basin has a long, narrow shape which is characteristic of other stream basins in eastern Iowa. The Iowa River Basin has a maximum width of 40 miles and an average width of 20 miles. There are many tributary streams, but they are generally short in length and have relatively small drainage areas, except for the English River which drains 638 square miles. Other tributaries with drainage areas larger than 200 square miles are Old Man Creek, Bear Creek, Salt Creek,

and the South Fork of the Iowa River. The Cedar River portion of the Basin is also long and narrow, particularly in the lower reaches, but gradually widens and becomes somewhat more fan-shaped further upstream.

PROBLEMS AND NEEDS

Over 93 percent of the land in the Basin is suitable for cultivation; of this, 15 percent has no problem to limit its use. The remaining land has limitations that either restrict its use or requires measures to preserve or develop the resource.

1. Erosion -- 3.8 million acres of crop, pasture and forest lands have a water and/or wind erosion hazard.

2. Floodwater and Sediment -- 46 cities have been identified as having flood problems. Flooding is a problem on 774,000 acres of crop and pastureland.

3. Impaired Drainage -- There are 2.4 million acres of crop and pastureland in the basin having a wetness problem. Currently 1.2 million acres need drainage development to reach full crop production.

4. Forest Resource -- The loss of forest land acreage to other uses and grazing of forest land continues to be a major forest resource problem.

5. Wildlife Habitat -- Intensive cropping and grazing, lack of edge habitat, and lack of woodland habitat are the most severe problems. The magnitude varies considerably with the northern portion having the most restrictive habitat conditions and the greatest need for more quality grassland and woodland.

6. Production -- The agricultural capacity of the Basin is sufficient to supply the needs in each of the future years studied. Timber products are expected to fall short of present and projected demand.

7. Water -- Point and non-point pollutants are the greatest water problems.

8. Recreation -- The Basin cannot meet the peak day recreation demand. Water-oriented recreational areas are needed.

FINDINGS AND CONCLUSIONS

The application of land treatment measures is a primary consideration for full resource development of the Basin. Assistance is available to landowners from existing State and Federal agencies. Information, assistance, cost-sharing and credit is available under existing programs.

The full development and utilization of the soil resources will require application of needed land treatment on the 4.94 million acres of agricultural land needing treatment. The going program will not meet the need in the next 50 years.

Four potential upstream watersheds were found to be feasible for project action, and need to be installed in the next 10-15 years. The installation cost for these four watersheds covering a total of 211,600 acres of drainage area is $12,221,100. These structural measures are estimated to produce an estimated $2,218,000 average annual benefits at an average annual cost of $898,000. These projects need an estimated 9 structures and 58.3 miles of channel work. Benefits will accrue to 42,830 acres. Detailed plans for specific works of improvement can be developed in cooperation with responsible sponsoring local organizations. The potential for enhancement of fish and wildlife and the environment in general, may be studied by concerned agencies and feasible developments recommended for inclusion in the individual watershed work plans.

CHAPTER 1

INTRODUCTION

This report presents results of the study and analysis of physical and economic potential for the management and development of water and related land resources, both from the short-term and long-term viewpoints, in the Iowa-Cedar Rivers Basin. The identification of problems, and present and future needs were the basis for this study.

A. DESCRIPTION

The Iowa-Cedar Rivers Basin study area encompasses 12,971 square miles or 8,301,440 acres. It includes the Iowa-Cedar Rivers drainage area of 12,637 square miles and the Flint River Subbasin containing 334 square miles. Ninety-two percent, or 7,646,740 acres, is in Iowa and includes about 23 percent of the area of that State. The remaining 8 percent, or 654,700 acres, is in Minnesota. The Basin is 250 miles long, and 100 miles wide at its widest point.

The population within the hydrologic boundary of the Basin, based on 1970 census data, is estimated to be 834,000 with 25 percent residing on farms or in rural residences. The largest city, Cedar Rapids, had a 1970 population of 110,642. Seven other cities had populations exceeding 25,000.

Agriculture and related industries are the most important economic activities. About 90 percent of the farms are classed as commercial. The total 1970 farm employment was 38,167. Forty percent of the farm operators had off-farm employment. Cash-grain farms are predominant in the northern two-thirds of the Basin. Livestock production is dominant in the southern third.

B. AUTHORITY

This study was made under the authority of Section 6 of the Watershed Protection and Flood Prevention Act (Public Law 566, as amended). This authorizes the Secretary of Agriculture to cooperate with other Federal, State, and local agencies in their investigation of the watersheds of rivers and other waterways to develop coordinated programs.

C. OBJECTIVES, SCOPE AND EXPECTED RESULTS

1. U.S. Department of Agriculture Objectives

The primary objective of the U.S. Department of Agriculture's participation in the Iowa-Cedar Rivers Basin Study was to provide data and alternatives for the coordinated and orderly conservation, development, utilization, and management of water, land, and related resources. The

Study identifies opportunities to develop and improve the environmental quality of the Basin in regard to land and water resources. These alternatives should prove useful to decision makers concerned with promoting the economic growth and development and provide long-term benefits to the residents of the Basin, State, Region, and Nation.

The Study includes identification and evaluation of potential projects and project type developments. Emphasis was given to those projects and measures which can be carried out under the authority of Public Law 566 and other USDA programs which should be initiated or accelerated during the next 10 to 15 years. Other water and related land resource developments that may be required to meet short-range and long-range needs were identified and possible means of implementation described. U.S. Department of Agriculture participation included an appraisal of overall water and related land resource problems, needs, and potentials for the years 1980, 2000 and 2020.

Major points of the study included:

a. Updating the agricultural and forestry resource data and present resource development;

b. The development of alternatives for a desirable pattern of land use, treatment, and management;

c. An assessment of future water needs for agriculture, municipalities, industries, recreation, and fish and wildlife;

d. An evaluation of potential works of improvement for upstream watershed protection, flood prevention, and agricultural water management;

e. An evaluation of potential water impoundment sites for flood prevention, recreation, fish and wildlife, low flow augmentation, and municipal and industrial supply;

f. Consideration of the effects of agricultural and forestry programs and projects on the overall quality and quantity of surface water resources;

g. Identification of the implementing actions that could facilitate the planned use of water and related land;

h. An evaluation of the physical, economic, and social consequences of development alternatives;

i. An assessment of the impacts of potential and alternative developments on the environment.

2. State Sponsoring Agency Objectives

The studies, investigations, and analyses were directed toward meeting the following objectives:

a. Identify water impoundment opportunities for:

(1) Flood protection,
(2) Recreation,
(3) Fish and wildlife;

b. Identify:

(1) Existing forest land,
(2) Forest land opportunities for wildlife habitat recreation and environment corridors,
(3) Potential for recreation and open space land,
(4) Urban and rural water and related land problems,
(5) Areas deficient in recreational opportunities and/or fish and wildlife habitat,
(6) Opportunities for enhancement of wildlife habitat,
(7) Fishing and boating streams,
(8) Streams that have additional recreation potential,
(9) Land treatment needs for the Basin;

c. Inventory feedlots with capacities between 250 and 1,000 animal units by county with topographic location;

d. Identify potentially feasible Public Law 566 watershed projects including opportunities for both multiple-purpose and single-purpose site development;

e. Correlate surface and ground water hydrology for the Basin;

f. Collect and record data usable in a comprehensive water study including cross-reference to a Basin study conducted by the Corps of Engineers and discussion of the two studies as alternative or complementary programs.

D. PARTICIPANTS

The USDA agencies participating in this study were the Soil Conservation Service, the Forest Service, and the Economic Research Service. This coordinated effort within the Department was in accordance with a Memorandum of Understanding between the three agencies.

The State of Iowa participated in this study through the sponsorship of the Iowa Department of Soil Conservation, the Iowa Conservation Commission, and the Iowa-Cedar River Conservancy District. The State of Minnesota sponsor was the Minnesota Soil and Water Conservation Commission. These State agencies coordinated the participation and contributions of other State agencies.

E. INVESTIGATIONS AND USE

Information from previous studies, as well as from various Federal, State, and private sources, was used to the extent possible. The USDA 1967 Conservation Needs Inventory reports for Iowa and Minnesota were the basis for determining conservation treatment needs, land use, and distribution of land capability classifications. The Upper Mississippi River Comprehensive Basin Study report was also used.

Information obtained from maps and photographs, field reconnaissance, and interviews were used in identifying those watersheds with potential for development. These watersheds were studied in sufficient detail to identify the intensity and extent of flooding, erosion, and water management problems. Flood plain information on soils, land use, and historical flooding was collected in the field. Valley cross-sections for flood routing purposes were obtained in each watershed that indicated a short-range development potential. These data were used to evaluate damages and benefits.

Full use was made of aerial photographs and topographic and other maps in the inventory of potential reservoir sites. Those sites identified were checked by field reconnaissance.

Projections of population, employment, income, agricultural production, and use of water and related land resources for the years 1980, 2000, and 2020 were updated from similar projections developed for the Upper Mississippi River Basin and other related studies. Price levels prevailing in January 1972 were used for evaluating present and future benefits and costs.[1/] The beneficial effects from agricultural production were evaluated on the basis of current normalized prices.

The results are available for use by resource planners and decision makers for use in planning and funding of programs for the conservation and development of water and related land resources. The study also indicates which projects and measures can be carried out under the authority of Public Law 566, the Watershed Protection and Flood Prevention Act, or other USDA programs which could be accelerated or initiated during this period. Other water and related land resource developments that may be required to meet short-range and long-range needs were also identified and possible means of implementation described.

1/ Guideline 2, Agricultural Price Standards for Water and Related Land Resource Planning by Water Resources Council.

F. ACKNOWLEDGEMENTS

Cooperation, data, and assistance for this report were provided by the following:

Iowa Cedar Rivers Conservancy District
Iowa Conservation Commission
Iowa Department of Environmental Quality
Iowa Department of Soil Conservation
Iowa Department of Transportation
Iowa Development Commission
Iowa Geological Survey
Iowa Natural Resources Council
Iowa Office for Planning and Programming
Iowa State Archeologist
Iowa State University
Minnesota Department of Natural Resources
Minnesota Pollution Control Agency
Minnesota Soil and Water Commission
Area Six Regional Planning Commission
Area XV Regional Planning Commission
East Central Intergovernmental Association
East Central Iowa Association of Regional Planning Commissions
Freeborn County Planning and Zoning Commission
Iowa Northland Regional Council of Governments
Mid-Iowa Development Association Regional Planning Commissions
Mower County Planning and Zoning Commission
North-Iowa Area Council of Governments
Southeast Iowa Regional Planning Commission
U.S. Army Corps of Engineers, Rock Island District
U.S. Environmental Protection Agency
U.S. Geological Survey

CHAPTER 2

ENVIRONMENTAL SETTING

The Iowa-Cedar Rivers Basin is located in the heart of the Corn Belt in Iowa and Minnesota (Figure II-1). Productive agriculture is made possible by large areas of highly fertile soils and a favorable climate. Soils, geology, physiography, climate, land use, and water quality and quantity are environmental factors which must be considered in planning resource development programs. Each is important and makes its own unique contribution to the physical capacity, potential development, and environmental quality of the Basin. This chapter describes and inventories these resources.

A. DESCRIPTION

The Iowa River begins at the junction of the East and West Branch near the Hancock-Wright County line. The Iowa flows in a southeasterly direction to the Mississippi River about one-half way between Muscatine and Burlington, Iowa. All of the Iowa River subbasin lies in the State of Iowa. The Iowa River Subbasin, which drains 4,818 square miles or 3,083,520 acres, has a long, narrow shape characteristic of streams in the eastern part of the State. It has a maximum width of 40 miles with an average width of 20 miles. There are many streams tributary to the Iowa but they are generally short in length and have relatively small drainage areas. The English River is an exception, draining 638 square miles. Other tributaries with drainage areas larger than 200 square miles are Old Man Creek (248 square miles), Bear Creek (222 square miles), Salt Creek (223 square miles), and the South Fork of the Iowa River (309 square miles).

The Cedar River rises in marshy depressions in the lake region of south-central Minnesota. Draining an area of 7,819 square miles, with about 1,023 square miles in Minnesota, the Cedar flows in a southeasterly direction through east-central Iowa. The Cedar River Subbasin is also long and narrow, particularly in the lower reaches. It joins the Iowa River 30 miles upstream from the confluence of the Mississippi. The largest tributary to the Cedar is the Shell Rock River which drains 1,783 square miles. It flows in a southeasterly direction, and joins the Cedar River near the Bremer-Black Hawk County line in Iowa. The Shell Rock River begins at the outlet of Lake Albert Lea in Minnesota. The West Fork Cedar River drains 856 square miles and begins in south-central Cerro Gordo County. The Winnebago River, tributary to the Shell Rock, drains an area of 700 square miles. Other tributaries of the Cedar with drainage areas larger than 200 square miles are Prairie Creek (216 square miles), Wolf Creek (328 square miles), Blackhawk Creek (344 square miles), Beaver Creek (391 square miles), and Little Cedar River (265 square miles).

IOWA - CEDAR RIVERS BASIN

IOWA AND MINNESOTA

SCALE 1/850,000

SCALE 10 0 10 20 30 40 MILES

FIGURE II-1

SOURCE USGS 1/500,000 BASE MAP (IOWA AND MINNESOTA), SCS DRAWING 5,0-28270
LATE EDITION COUNTY HIGHWAY MAPS AND 1973 OFFICIAL HIGHWAY MAP OF IOWA

LAMBERT CONFORMAL CONIC PROJECTION

USDA-SCS-LINCOLN, NEBR. 1974

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5,S-32382

The Flint River Subbasin, draining 334 square miles, includes all the drainage lying south of the Iowa River Subbasin to the mouth of the Skunk River. The subbasin includes the Flint River, and several small tributaries that flow directly into the Mississippi River.

All or parts of 39 counties lie within the Basin boundary (Table II-I). Nine counties are entirely in the Basin. The Basin contains 232 cities. Of these 206 had a 1970 population less than 2,500 which indicates its rural characteristics; 18 had populations from 2,500 to 20,000; none 20,000 to 25,000; and 8 had populations larger than 25,000. These eight cities contain 45 percent of the total Basin population of 834,000.

TABLE II-1

COUNTY ACREAGE AND PERCENT WITHIN THE BASIN

Iowa-Cedar Rivers Basin

State and County	Area in Basin		State and County	Area in Basin	
	Acres	Percent		Acres	Percent
Minnesota			Hardin	366,740	99.8
Dodge	42,970	15.4	Henry	4,240	1.4
Freeborn	354,340	77.1	Iowa	373,760	100.0
Mower	253,220	56.2	Jasper	5,680	1.2
Steele	4,170	1.5	Johnson	395,840	100.0
			Jones	3,340	0.9
Subtotal-Minn.	654,700	7.8	Keokuk	64,590	17.1
			Linn	364,550	78.4
Iowa			Louisa	233,520	88.9
Benton	459,520	100.0	Mahaska	1,240	0.3
Black Hawk	321,510	87.0	Marshall	314,430	84.1
Bremer	136,560	47.7	Mitchell	268,330	88.1
Buchanan	83,330	22.5	Muscatine	208,760	73.0
Butler	372,480	100.0	Poweshiek	283,850	74.0
Cedar	210,720	55.3	Scott	18,100	6.1
Cerro Gordo	368,640	100.0	Story	33,810	9.1
Chickasaw	51,710	15.7	Tama	460,800	100.0
Des Moines	215,200	80.7	Washington	187,750	50.7
Floyd	321,920	99.3	Winnebago	139,970	53.5
Franklin	375,040	100.0	Worth	256,200	100.0
Grundy	320,640	100.0	Wright	153,960	40.9
Hamilton	38,460	10.2			
Hancock	231,550	62.3	Subtotal-Iowa	7,646,740	92.2
			GRAND TOTAL	8,301,440	100.0

B. CLIMATE

Climate of the Basin is of the continental type. Hot winds and periods of prolonged high temperature occur occasionally from May to September. Cold waves are usually of the boreal type, rushing southward over the area from the continental Arctic regions. At Waterloo, Iowa, near the center of the Basin, the annual precipitation is 31.5 inches; the average annual temperature is 47.2°F; the average growing season is 153 days; and the annual snowfall is 28.6 inches.

Figure II-2 shows variances in precipitation, temperature, freeze-free periods, and snowfall. Precipitation ranges from about 30 inches in the north to 36 inches in the south. Average annual temperatures range north to south from about 43 to 50°F. Freeze-free (growing seasons) periods range from 135 days in the north to 170 days in the south.

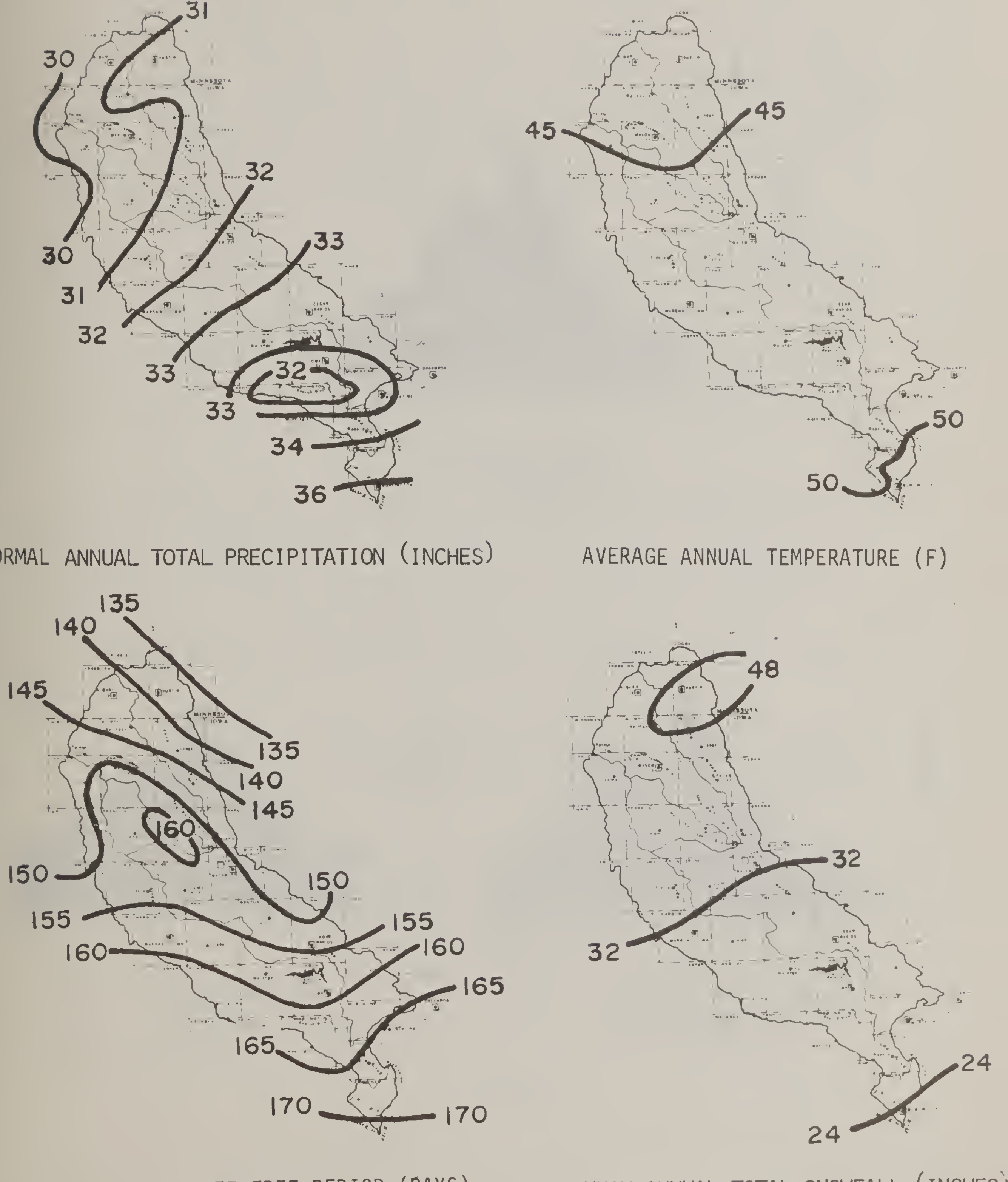
Prevailing winds are northwesterly, however, from April to October southerly winds predominate. April is the windiest month and August the least windy. The most destructive winds known to the Basin are tornadoes. Studies by the U.S. Weather Bureau show that any spot in the Basin is vulnerable to tornadoes.

During most years, precipitation is adequate for satisfactory crop growth. About 71 percent of the average annual precipitation occurs during the growing season (Figure II-3). Corn grows best in a climate that provides rain and warm weather during the growing season. The region of greatest corn production in the United States has a mean summer temperature of 70-80°F, and a freeze-free season of over 140 days. For optimum growth and grain production, corn requires a plentiful supply of moisture throughout the growing season. Areas which have well-distributed rains during June, July, August, averaging three to six inches a month, have the largest average yields. The Basin has all of these prerequisites in a normal year. Soybeans, small grains and forage crops also thrive in these climatic conditions and consistently produce some of the highest yields in the Corn Belt.

C. PHYSIOGRAPHY AND GEOLOGY

The river and stream valleys of the Basin lie on glacial topography. They are integrated with and superposed on surfaces whose features and sediments document a history of multiple continental glaciation. Several unique physiographic elements can be identified through similarities in drainage, texture, relief, and landform. The major physiographic features recognized in the Basin are the Des Moines Glacial Lobe, Iowan Erosion Surface, Kansan Drift Area, Lake Calvin Basin, and the Illinoian Drift Plain. A portion of the Northeast Iowa Karst Region, occurs in Floyd and Mitchell counties.

CLIMATIC DATA
IOWA-CEDAR RIVERS BASIN



NORMAL ANNUAL TOTAL PRECIPITATION (INCHES)

AVERAGE ANNUAL TEMPERATURE (F)

MEAN LENGTH OF FREEZE-FREE PERIOD (DAYS)

MEAN ANNUAL TOTAL SNOWFALL (INCHES)

Figure II-2

MONTHLY RAINFALL DISTRIBUTION
IOWA-CEDAR RIVERS BASIN

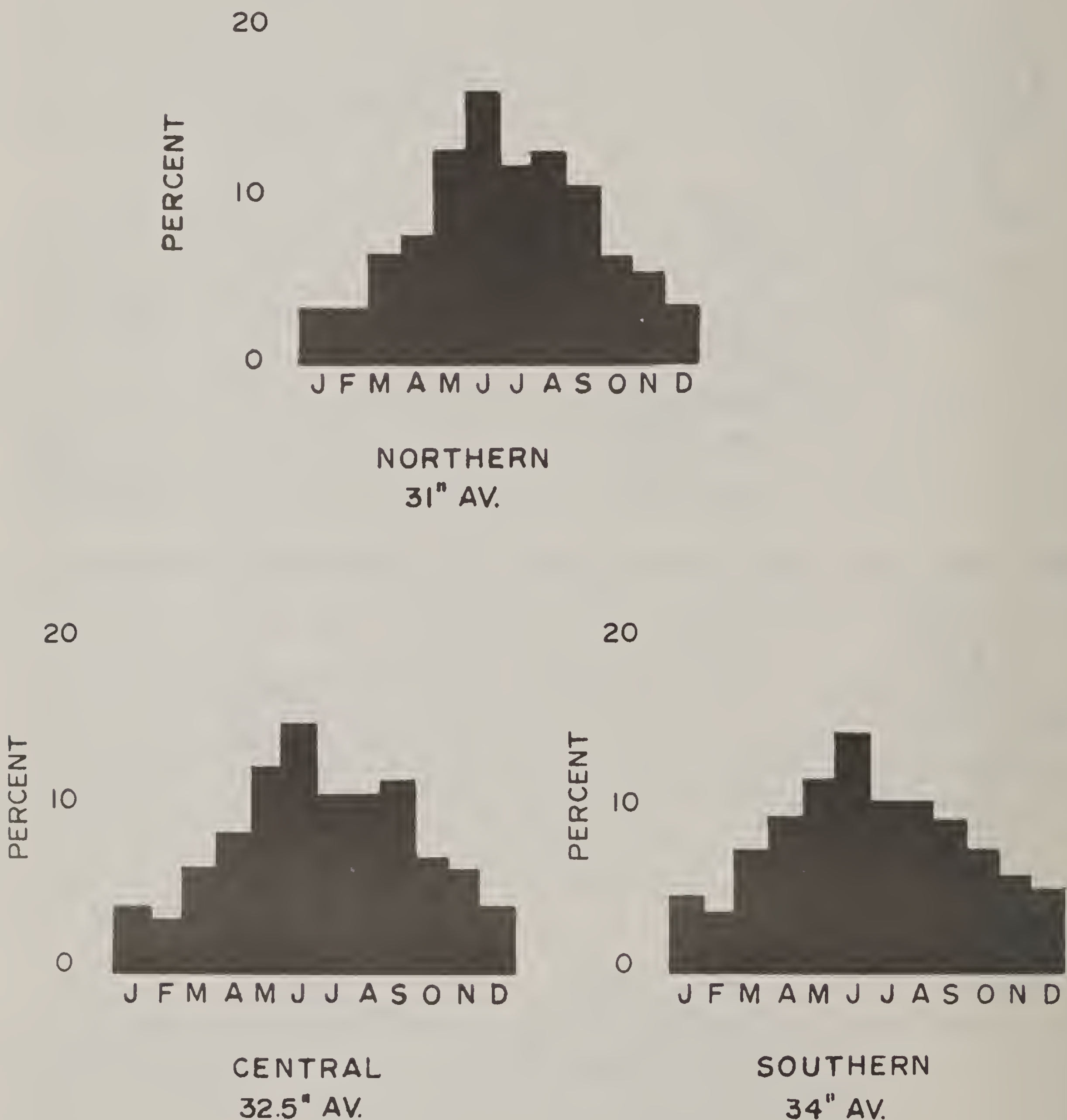


Figure II-3

The headwaters of several major streams of the Basin rise on the poorly drained, undulating surface of the Des Moines Lobe. The eastern margin of the Des Moines Lobe approximates a line drawn just east of the Marshall-Story County boundary, then northward through Eldora, Hampton, Mason City, and Northwood, to about midway between Albert Lea and Austin, Minnesota. This line also approximates the position of the oldest, outermost moraine system of the Wisconsin glacial episode, the Bemis end moraine. To the west, approximately forming the northwestern drainage divide of the Basin from Freeborn County, Minnesota, to the south line of Hamilton County, Iowa, is a younger Wisconsin moraine, the Altamont.

The Altamont moraine is seen as a relatively narrow belt of low parallel ridges. Easterly, the sheet-like outwash associated with Altamont end moraine spreads to gradually merge with the broad ground moraine behind the Bemis end moraine. This older Wisconsin ground moraine is only slightly dissected by existing streams and is characterized by its numerous lakes, undrained depressions, and swell and swale topography. The transition from ground moraine to the Bemis end moraine is gradual and nearly imperceptible.

The features of the Des Moines Lobe blend rapidly with the broad, gently rolling, boulder strewn, Iowan Surface that dominates the eastern two-thirds of the Basin from Dodge County, Minnesota, to Linn County, Iowa. There is evidence to indicate that the Iowa Surface is erosional, formed on glacial materials of Kansan age, and predates the Bemis moraine system. Characteristically, the Iowan surface area is well drained. The valleys of the major streams generally have wide floors and are flanked by low rolling hills that merge with tabular, moderately dissected divides.

Tributary valleys have low relief, little more than creasing the broad Iowan Surface. The southern margin of the Iowan Surface is marked by the sharp contrast of its features with those of the more highly dissected Kansan Drift Area.

Dominating the landscape of Marshall, southern Tama and Benton, Poweshiek, Iowa, and Johnson Counties are those features characteristic of the Kansan Drift Area. Kansan topography has fine drainage texture, narrow divides, and relatively strong relief. Most of the flat land in the Kansan drift area is found in the valleys of the major streams. Locally, however, broad relatively flat upland areas exist on the Kansan. These exist where the areas between major streams are wide. The topography of the Kansan has been sculptured on a drift depositional surface that has been covered by a variable thickness of loess.

Spreading into Washington, Johnson, and Cedar Counties from northwestern Muscatine County is the level floor of former Lake Calvin. Calvin Basin is outlined by rolling Kansan terrain except along the southeastern margin where the gradual slopes climb to intersect the gently undulating surface of the Illinoian Drift Plain. A considerable area is dominated by the meander scars and back water sloughs created by the Iowa and Cedar Rivers as they shifted back and forth across the flat basin floor.

The topography of the Basin has developed on glacial sediments deposited over gently southwestward sloping bedrock layers. Prior to glaciation these rock layers were truncated and sculptured by weathering and erosion. Streams carved their valleys in the less resistant shales, while the more resistant limestones and dolostones persisted to form ridges and uplands. The drainage, which has developed on the glacial drift mantle, is gradually lowering itself to the bedrock surface. In places, stream valleys are already trenched into the bedrock; elsewhere they meander across wide valley floors developed on the nearly flat rock surface. The Basin is underlain dominantly by rock formations of Devonian age, and to a lesser extent by Mississippian formations in a narrow band along the southwestern boundary. Generally, the rock formations are nearer the surface in those areas that coincide with the Iowan Surface. The drift over the bedrock in these areas was largely removed during the glacial erosion of the surface. This is most evident in Cerro Gordo, Butler, Floyd, and Mitchell Counties.(Figure II-4).

In Floyd and Mitchell Counties unique, humocky topography has developed with sink holes that pock mark the otherwise flat Iowan Surface. The sink holes are depressions created by collapse of surface and underlying materials into bedrock voids created by solution of the bedrock by percolating groundwater. The term applied to such terrain is "Karst".

D. LAND RESOURCES

General information on land resource areas, land capability classification, soil resource groups, and land use is presented in this section.

The predominant soils are grouped by texture and slope into 23 associations and are described in the legend of the Generalized Soils Map (Figure II-5). More detailed information is available from local U.S. Department of Agriculture service centers.

UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

BEDROCK MAP
IOWA-CEDAR RIVERS BASIN
IOWA AND MINNESOTA

Figure II-4

SCALE 1/1,660,000

SCALE IN MILES

LAMBERT CONFORMAL CONIC PROJECTION.

SOURCE: 5,0-28,270, IOWA GEOLOGICAL SURVEY, AND INFORMATION FROM FIELD TECHNICIANS.

USDA-SCS-LINCOLN NEBR 1973

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SOIL ASSOCIATION MAP
IOWA-CEDAR RIVERS BASIN
IOWA AND MINNESOTA

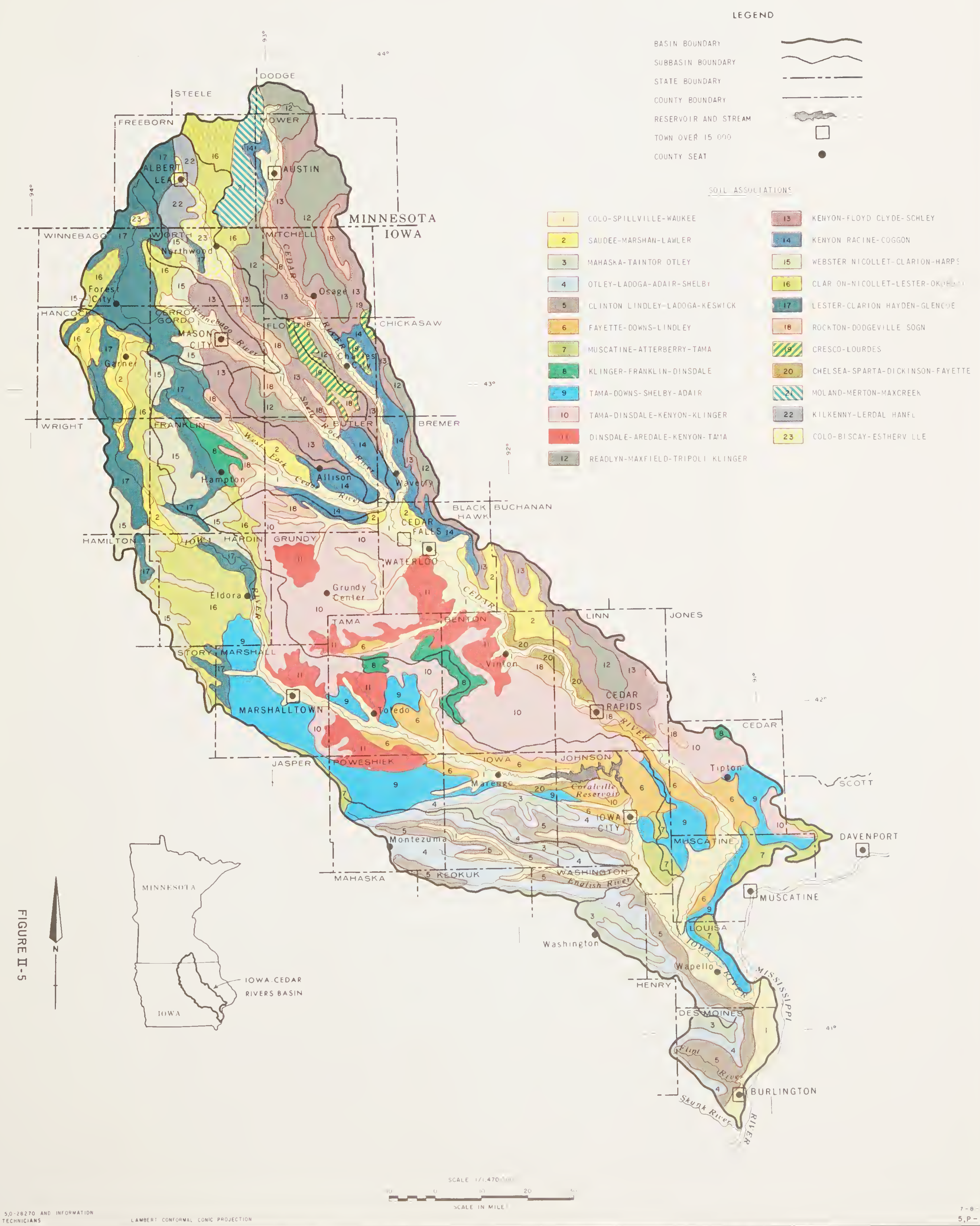


FIGURE II-5

SOURCE
SCS DRAWING 5,O-28270 AND INFORMATION
FROM FIELD TECHNICIANS

7-8-71
5,P-28965

LEGEND

	Soil Association	Approximate Acreage
1	Colo-Spillville-Waukee Level to gently sloping (0 to 5%) Alluvial soils on first and second bottomlands	1,130,250 ac.
2	Saudee-Marshan-Lawler Level to gently sloping (0 to 5%) Outwash soils on high stream terraces and uplands	275,000 ac.
3	Mahaska-Taintor-Otley Nearly level to gently sloping (0 to 5%) Deep loess soils.	90,000 ac.
4	Otley-Ladoga-Adair-Shelby Gently sloping to strongly sloping (2 to 14%) Loess soils on the ridges and glacial till soils on the side slopes.	350,000 ac.
5	Clinton-Lindley-Ladoga-Keswick Moderately sloping to steep (5 to 30%) Timbered soils on loess ridges and glacial till side slopes.	220,000 ac.
6	Fayette-Downs-Lindley Moderately sloping to steep (5 to 40%) Timbered soils on loess ridges and glacial till side slopes.	401,500 ac.
7	Muscatine-Atterberry-Tama Nearly level to gently sloping (0 to 5%) Deep loess soils.	140,000 ac.
8	Klinger-Franklin-Dinsdale Nearly level to gently sloping (0 to 5%) Soils developed in thin loess over glacial till.	140,000 ac.
9	Tama-Downs-Shelby-Adair Moderately to strongly sloping (5 to 14%) Loess soils with some glacial till on the side slopes.	560,000 ac.
10	Tama-Dinsdale-Kenyon-Klinger Gently to moderately sloping (2 to 9%) Loess soils and soils developed in thin loess over glacial till.	940,000 ac.
11	Dinsdale-Aredale-Kenyon-Tama Gently to moderately sloping (2 to 9%) Soils developed in thin loess over glacial till.	320,000 ac.
12	Readlyn-Maxfield-Tripoli-Klinger Level and nearly level (0 to 2%) Glacial till soils and soils developed in thin loess over glacial till.	493,800 ac.
13	Kenyon-Floyd-Clyde-Schley Nearly level to undulating and gently rolling (0 to 9%) Glacial till and outwash over glacial till soils.	1,025,000 ac.
14	Kenyon-Racine-Coggon Undulating to rolling and hilly (2 to 18%) Glacial till soils.	291,250 ac.
15	Webster-Nicollet-Clarion-Harps Level to undulating (0 to 5%) Glacial drift soils. Characterized by ponded spots and high lime areas	440,000 ac.
16	Clarion-Nicollet-Lester-Okoboji Undulating to gently rolling (2 to 9%) Glacial drift soils.	520,500 ac.
17	Lester-Clarion-Hayden-Glencoe Gently rolling to hilly or steep (5 to 20%) Glacial drift soils.	505,000 ac.
18	Rockton-Dodgeville-Sogn Nearly level to very steep (2 to 40%) Loamy and silt loam soils, shallow to moderately deep to limestone.	182,750 ac.
19	Cresco, Lourdes Nearly level to undulating (0 to 5%) Soils developed in firm to very firm glacial till.	43,000 ac.
20	Chelsea-Sparta-Dickinson-Fayette Gently rolling to very steep (5 to 40%) Sandy soils and sand-loess complex areas.	18,000 ac.
21	Moland-Merton-Maxcreek Undulating to gently rolling (0 to 9%) Soils formed in a thin mantle of silts over friable drift.	88,000 ac.
22	Kilkenny-Lerdal-Hanel Gently rolling to hilly (5 to 20%) Clayey mantled glacial till.	50,250 ac.
23	Colo-Biscay-Estherville Level to gently sloping (0 to 5%) Alluvial soils on first and second bottomlands.	76,500 ac.
	Watershed Area	8,300,800 ac.

1. Land Resource Areas

LRA's (Land Resource Areas) are defined as broad geographic areas having similar economic, soil, climatic, geologic, vegetative, and topographic features. The Basin lies in portions of three LRA's - 103, 104, and 108[1/] (Figure II-6). All three are located in the Central Feed Grains and Livestock Land Resource Region.

LAND RESOURCE AREAS
IOWA-CEDAR RIVERS BASIN

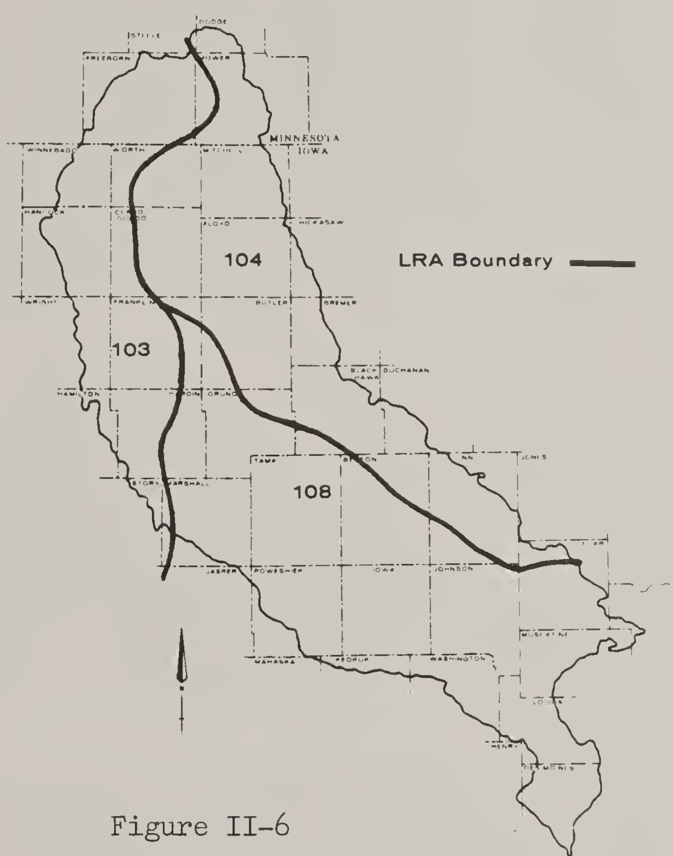


Figure II-6

In LRA 103, Central Iowa and Minnesota Till Prairie, the dominant soil types are Clarion, Nicollet, Webster, and Storden. These soils were developed in medium textured calcareous glacial till. Most soils of this area occur on level or gently rolling topography. When used for row crop production Clarion and other sloping soils need erosion control measures, while Webster and other nearly level soils require artificial drainage. Hayden soils are also present in narrow bands on steep slopes bordering stream valleys.

1/ Land Resource Regions and Major Land Resource Areas of the United States. Agricultural Handbook 296, USDA Soil Conservation Service, 1965.

In LRA 104, Eastern Iowa and Minnesota Till Prairie, Ostrander, Kenyon, and Cresco soils are prevalent and occur on gently rolling topography. These soils were also developed in calcareous glacial till. Readlyn and Clyde soils are found on the nearly level landscapes of the area. Many of the soils, such as Clyde, require artificial drainage before they can be successfully used for common field crops. Erosion is a problem on some of the more sloping areas.

In LRA 108, Illinois and Iowa Deep Loess Drift, Tama, Muscatine, Sharpsburg, Shelby, and Mahaska soils are dominant. All are developed in loess. Associated soils on flats and depressions are Garwin, Winterset, and Taintor which require artificial drainage for best crop production. Fayette, Clinton, and Lindley soils are conspicuous on the steep slopes adjacent to major streams. Much of the area has rolling to hilly topography, but some extensive level to undulating uplands exist in areas distant from the larger streams. The smaller streams have narrow valley floors, but the larger ones have rather broad floodplains. Water erosion is a major management problem on the more sloping areas. Most of the soils are moderately to highly productive.

2. Land Capability Classification

Land in the Basin varies widely in capability for agricultural use. Although agricultural land has many classifications, the Land Capability Classification of the U.S. Department of Agriculture is used to illustrate the type and degree of land problems. The USDA Land Capablity Classification is a grouping of soils having similar characteristics and degrees of problem. Soils and climate are considered together as they influence use, management, and production on farms. Acreage estimates are based on current interpretations. New technologies in agriculture in the future may modify these interpretations.

Eight land classes express the range of suitability for cultivation and other uses and the need for conservation treatment. Only classes I through VII are found in the Basin. The classification contains two general divisions: (1) Land suited for cultivation and other uses - capability classes I through IV, and (2) land generally not suited for cultivation - capability classes V through VIII. The hazards and limitations in use increase as the class number increases. Class I has few hazards or limitations whereas Class VIII has a great many. Appendix A describes the land use capability classification and shows the acres in each.

There are 7 million acres of agricultural land in land capability classes I, II, and III. Of this, 88 percent are being cultivated (Figure II-7). The total land area considered in Figure II-7 does not include urban, federal land or water areas.

LAND CAPABILITY CLASSES
IOWA-CEDAR RIVERS BASIN

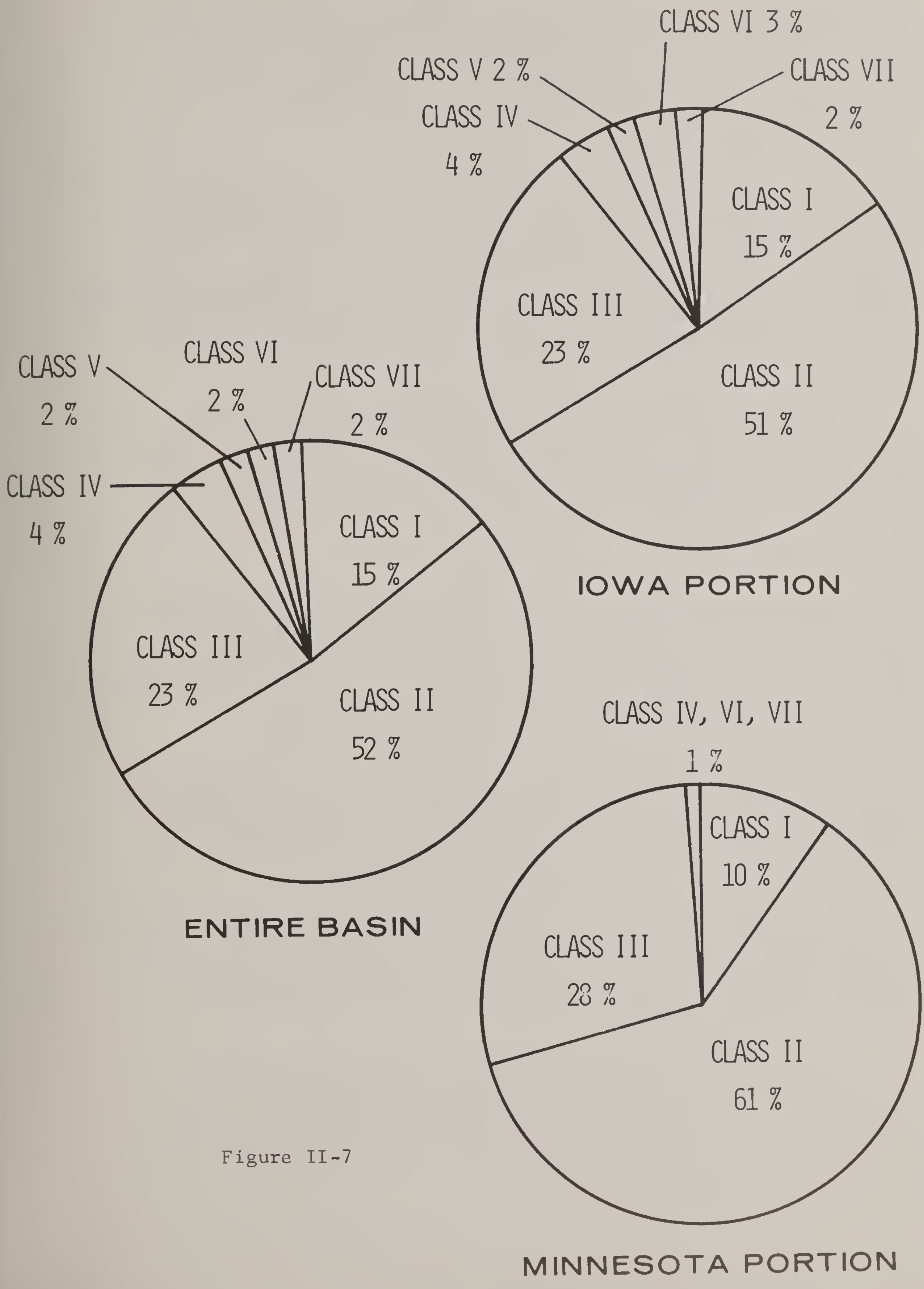


Figure II-7

There are 1.2 million acres of high quality class I land. Erosion and continuing use are minor problems. About 92 percent of this acreage is being cultivated. The 5.8 million acres in land classes II and III require moderate to intensive treatment for protection, improvement, and continuing production.

3. Soil Resource Groups

Within each land class are many soils of varying productive capability and with many different inherent problems (wetness, erosion, climate, etc.). These soils are mapped in LCU's (Land Capability Units). Because of the large number of LCU's, they are grouped into SRG's (Soil Resource Groups). SRG's are defined as a group of LCU's having similar cropping patterns, yield characteristics, responses to fertilizers, management problems, erosion problems, and land treatment needs.

A description of the SRG along with location, major soil and problem, slope and texture class is shown in Appendix B-1. SRG's 2, 3, and 20 contain the largest acreages of land as shown in Table II-2. Together these groups represent 72 percent of the farm land in the Basin.

4. Land Use

Agriculture land use varies in accordance with the general type of farming enterprise. Most farmland in the northern counties is utilized for grain production. The principal grain crops are corn and soybeans which are grown on over 60 percent of the cropland. Wheat, oats, rye, and grain sorghum are grown on very limited acreages. Table II-3 shows the land use of each of the subbasins.

Portions of the Basin have a variety of natural characteristics which lend themselves well to recreational pursuits. Forested bottom lands along the Iowa and Cedar Rivers offer a pleasant diversity of land use. Selected reaches of these rivers are designated by the Iowa Conservation Commission as canoe streams.

The diversity of terrain and the varying vegetational cover along these rivers, provides potential for development of a system of environmental corridors. High quality recreational opportunities could be provided to the majority of the Basin's population by proper corridor management.

In the northern third of the Basin, glaciation created a large number of lakes and marshes. Many of these have dried up naturally or were drained for agricultural purposes. The central nd southern portions of the Basin lack natural lakes. Large water bodies that can be used for recreation are Coralville Lake and Lake MacB ide located near Iowa City.

TABLE II-2

Soil Resource Groups
Iowa-Cedar Rivers Basin

SRG Number	Iowa Acres (000)	Minnesota Acres (000)	Total Acres (000)	Percent Distribution
1	54	1	55	1
2	2,760	171	2,931	38
3	1,311	30	1,341	17
4	144	3	147	2
5	33	39	72	1
6	24	1	25	*
9	3	0	3	*
10	86	56	142	2
11	2	0	2	*
12	10	0	10	*
13	92	0	92	1
14	195	38	233	3
15	155	1	156	2
16	47	15	62	1
18	571	0	571	7
19	13	0	13	*
20	1,118	199	1,317	17
21	16	26	42	1
22	48	41	89	1
23	153	3	156	2
25	16	0	16	*
28	295	1	296	4
29	31	0	31	*
Total	7,177	625	7,802	100

Source: Conservation Needs Inventory

*Less than .5 percent.

TABLE II-3

LAND USE DATA*

Iowa-Cedar Rivers Basin

	Unit	Per-cent	Iowa-Cedar Basin Total	Iowa River Sub-Basin	Cedar River Sub-Basin	W. Fork Cedar River Sub-Basin	Shell Rock River Sub-Basin	Flint River Sub-Basin
CNI Number				052100	052110	052112	052111	050000
Area	Sq. Mi.		12,971	4,818	5,180	856	1,783	334
Area	Acre	100	8,301,440	3,083,520	3,315,200	547,840	1,141,120	213,760
Cropland	Acre	79	6,568,270	2,390,560	2,652,840	456,500	930,850	137,520
Pasture	Acre	8	669,200	280,300	237,530	47,760	79,320	24,290
Forest	Acre	4	309,840	141,170	122,520	7,990	15,410	22,750
Other	Acre	3	256,270	80,710	112,510	13,140	44,850	5,060
Urban	Acre	5	434,510	156,330	186,960	22,320	59,070	9,830
Federal	Acre	**	31,880	27,270	0	0	0	4,610
Water	Over 40 Acres	**	31,470	7,180	2,840	130	11,620	9,700

* Source: Expanded Conservation Needs Inventory samples, Iowa and Minnesota
** Less than 1 percent.

E. WATER RESOURCES

Average annual runoff from the Basin varies from 5 inches in the north to 8 inches in the south (Figure II-8).

MEAN ANNUAL RUNOFF (INCHES)
IOWA-CEDAR RIVERS BASIN

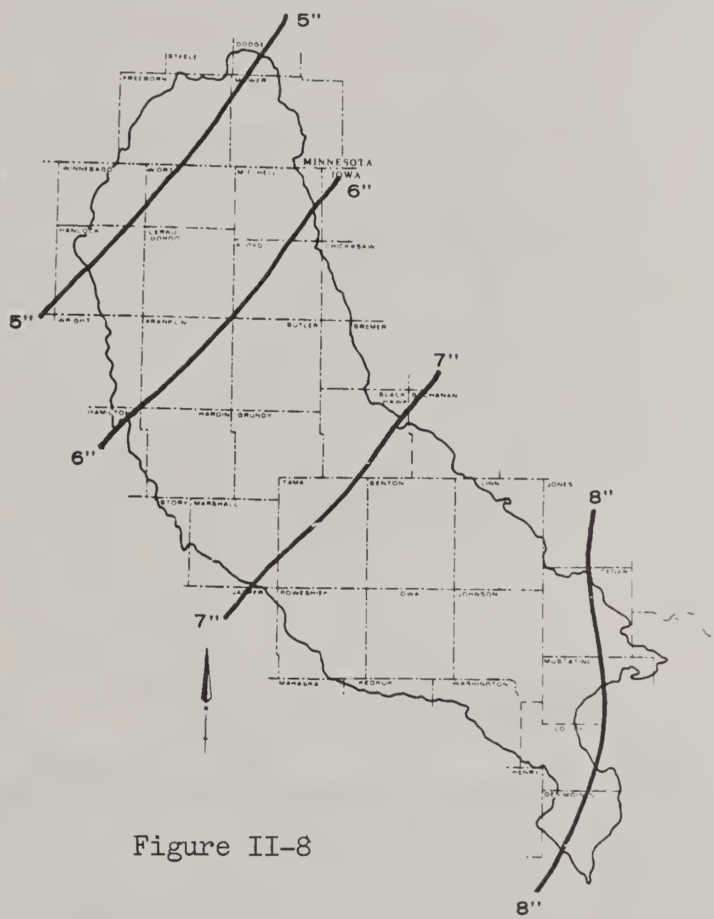
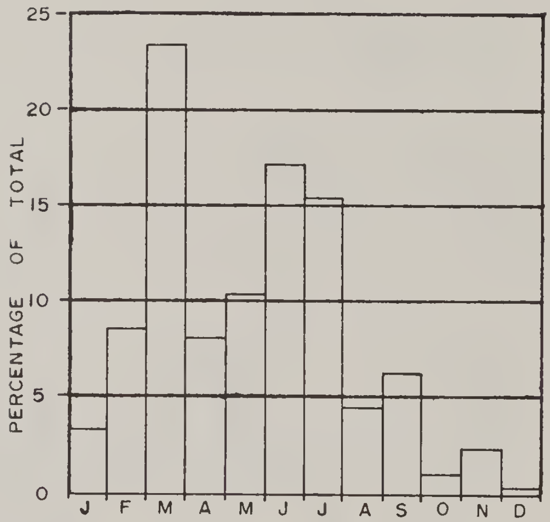


Figure II-8

On the larger streams, the highest annual flows frequently come from snow melt. An average of 23 percent of the floods occur in March. June and July combined account for another 32 percent. Monthly distribution of floods is shown in Figure II-9. Over half of the floods occur during the growing season, May through September.

The monthly distribution of runoff volume has a pattern similar to that shown for floods. The limiting season for water resource availability is in the late fall and winter.

MONTHLY DISTRIBUTION OF FLOODS
IOWA-CEDAR RIVERS BASIN



AVERAGE FOR 11 SELECTED STATIONS, 1957 THROUGH 1970

Figure II-9

The Office of Water Data Coordination, Department of the Interior, shows there are 166 surface water data stations and 83 ground water data stations in the Basin. The surface water stations include 160 stream sites, 5 lake sites, and 1 reservoir site. The stream sites include 10 sedimentation data collection points and 37 recording stream gage sites. Figure II-10 indicates general surface water quality conditions throughout the basin.

Ground water supplies generally are abundant and of good quality. There are some shallow aquifers that are not dependable or have poor quality water. The deeper aquifers occur in porous and creviced bedrock. The upper bedrock is of Devonian and Silurian age. The deeper-lying bedrock aquifers are carbonate and sandstone formations of Ordovician and Cambrian age representing the Galena-Platteville, St. Peter, Prairie du Chien, and Jordan Formations. Most domestic wells produce 10 to 40 gallons per minute. Larger wells that tap the bedrock aquifers can yield 1000-3500 gallons per minute of high quality water.

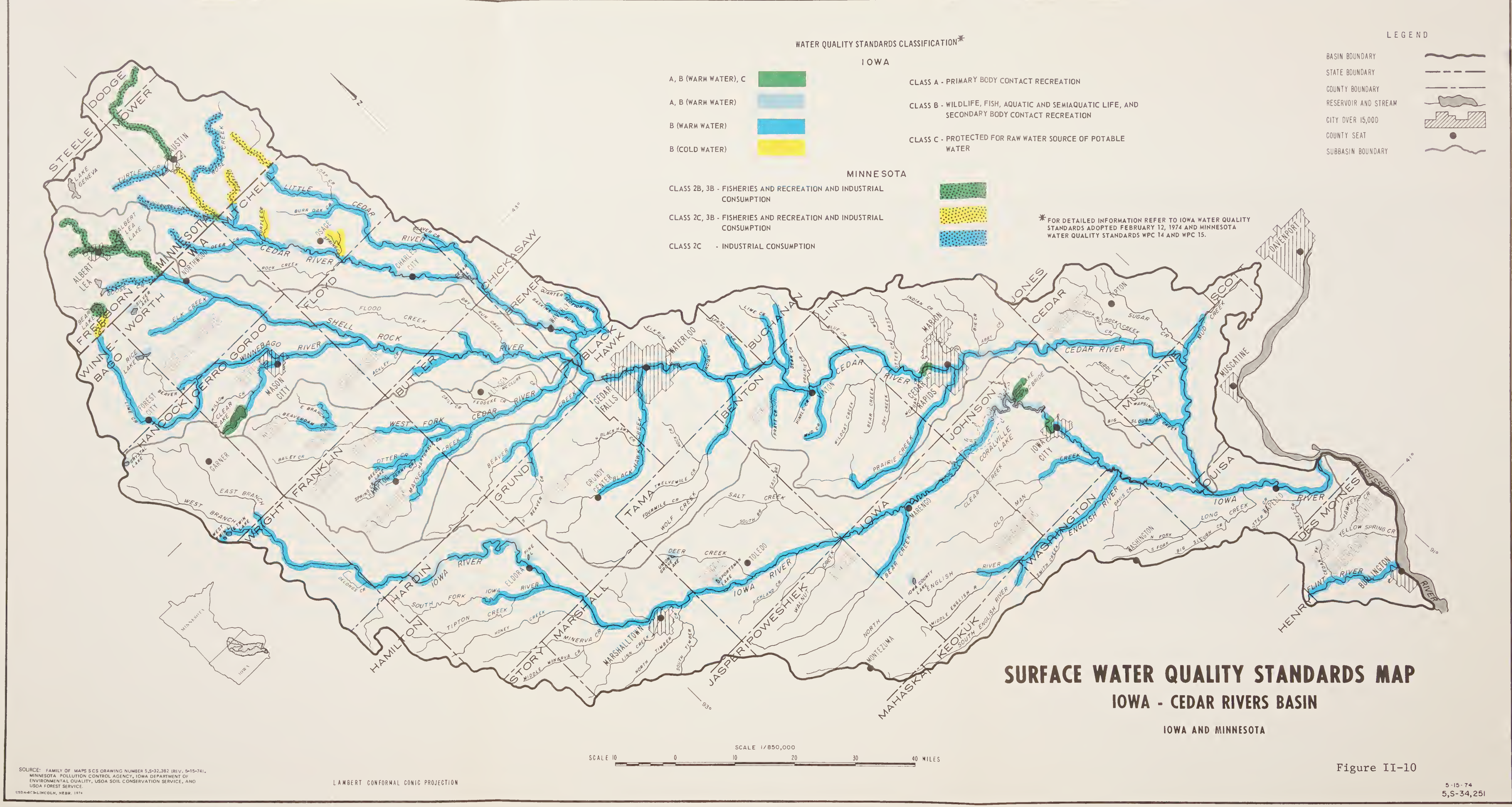

WATER QUALITY STANDARDS CLASSIFICATION*
IOWA
A, B (WARM WATER), C
A, B (WARM WATER)
B (WARM WATER)
B (COLD WATER)
CLASS A - PRIMARY BODY CONTACT RECREATION
CLASS B - WILDLIFE, FISH, AQUATIC AND SEMIAQUATIC LIFE, AND SECONDARY BODY CONTACT RECREATION
CLASS C - PROTECTED FOR RAW WATER SOURCE OF POTABLE WATER
MINNESOTA
CLASS 2B, 3B - FISHERIES AND RECREATION AND INDUSTRIAL CONSUMPTION
CLASS 2C, 3B - FISHERIES AND RECREATION AND INDUSTRIAL CONSUMPTION
CLASS 2C - INDUSTRIAL CONSUMPTION
* FOR DETAILED INFORMATION REFER TO IOWA WATER QUALITY STANDARDS ADOPTED FEBRUARY 12, 1974 AND MINNESOTA WATER QUALITY STANDARDS WPC 14 AND WPC 15.
LEGEND
BASIN BOUNDARY
STATE BOUNDARY
COUNTY BOUNDARY
RESERVOIR AND STREAM
CITY OVER 15,000
COUNTY SEAT
SUBBASIN BOUNDARY
SURFACE WATER QUALITY STANDARDS MAP
IOWA - CEDAR RIVERS BASIN
IOWA AND MINNESOTA
SCALE 1/850,000
SCALE 10 0 10 20 30 40 MILES
LAMBERT CONFORMAL CONIC PROJECTION
SOURCE: FAMILY OF MAPS SCS DRAWING NUMBER 5,S-32,382 (REV. 5-15-74), MINNESOTA POLLUTION CONTROL AGENCY, IOWA DEPARTMENT OF ENVIRONMENTAL QUALITY, USDA SOIL CONSERVATION SERVICE, AND USDA FOREST SERVICE.
USDA-SCS-LINCOLN, NEBR. 1974
5-15-74
5,S-34,251

Figure II-10

F. FISH AND WILDLIFE RESOURCES

As white settlers expanded farming operations, wildlife species either adapted to agriculture or perished. Existing wildlife has adapted to agriculture nd lives on land used by man for the primary function of raising food. Agricultural lands and farmer cooperation provide much food and cover essential in the development, production, and harvesting of wildlife resources. Most of the wildlife species in the Basin are found and harvested on land used for agriculture.

Climate, topography, geology, and soils influence the use man makes of the land. Composition of the plant communities, and the nature and abundance of the local plants, in turn, affects wildlife species distribution and abundance.

When the balance between wildlife and its habitat is recognized, it is possible to understand why some species that were never extensively hunted became extinct while others that have been intensively hunted are among our most abundant species. The whitetail deer, for example, is more abundant today than it was in 1900. Whitetail deer is the sole big game animal in the Basin and is found in every county. Although nearly gone by 1900, whitetail deer have since adapted to conditions associated with intensive agriculture and numbers are now limited principally by hunting. They are found in greater number in the wooded, rolling hills of the southern portion, but are often found miles from preferred woodland in the flat-country corn fields. The estimated deer population in the Basin is 5,200.[1/]

Small wildlife species found in wooded or forested areas include chipmunk, opossum, porcupine, raccoon, striped and spotted skunk, fox and gray squirrel, whitetail jackrabbit, cottontail rabbit, mink, and weasel.

Important fish species in the streams, lakes, and ponds are large and smallmouth bass, catfish, bullhead, walleye, northern pike, and crappie (Figure II-11). Approximately 110 species and subspecies of fish have been identified in the Basin. Over 1,300 farm ponds add to the opportunity for production and taking of fish. All the natural and artificial bodies of water have a potential of providing favorable habitat for a variety of aquatic and semi-aquatic animals, such as beaver, muskrat, and in some rare instances, otter.

The Basin has a variety of game birds. Quail are abundant in reas with woody and herbaceous cover in the southern half. They once covered the entire Basin which is on the northern edge of their range. The loss of brushy cover and severe winters have eliminated them from the northern counties. The major game bird, however,

1/ Iowa Conservation Commission

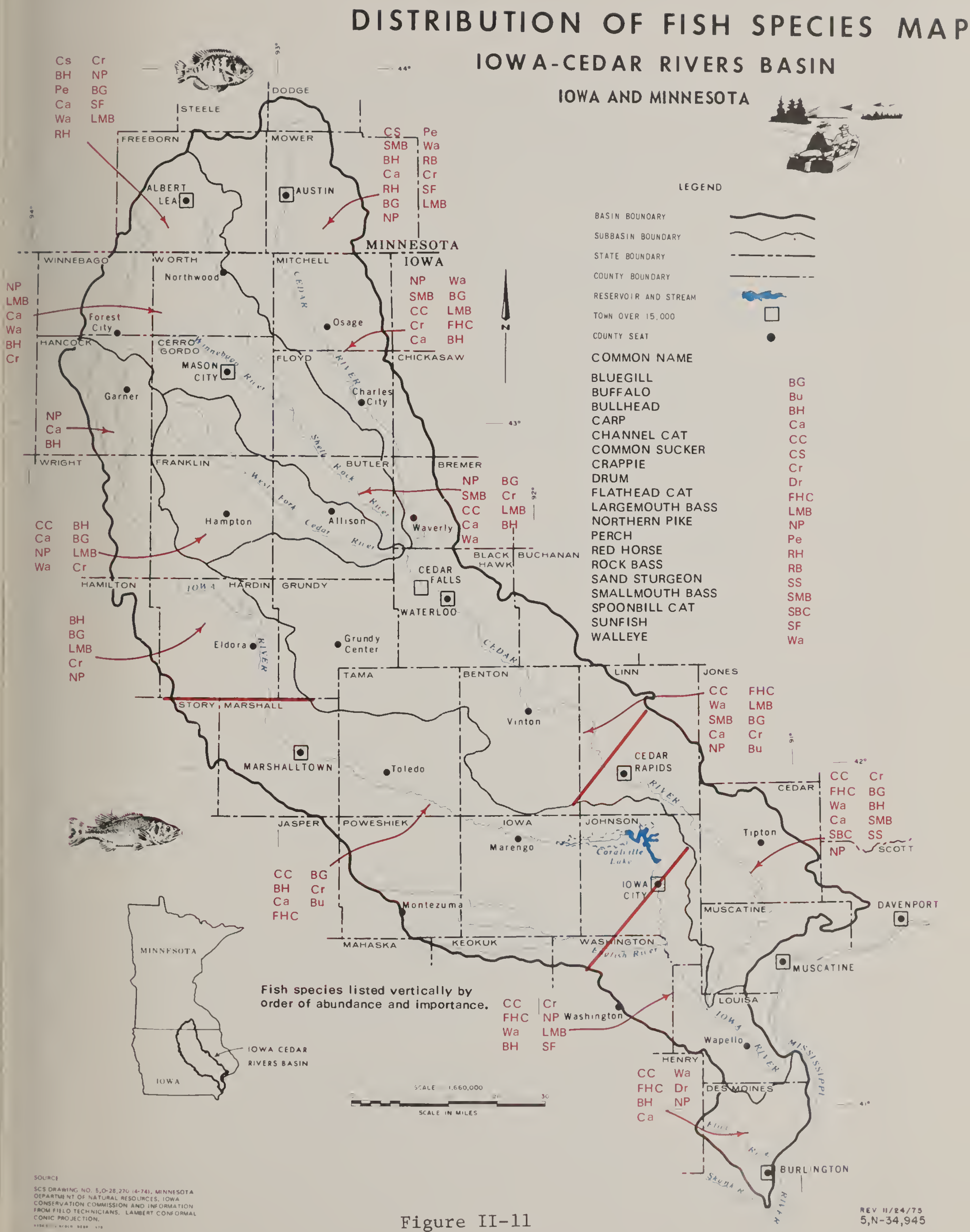

DISTRIBUTION OF FISH SPECIES MAP
IOWA-CEDAR RIVERS BASIN
IOWA AND MINNESOTA
LEGEND
BASIN BOUNDARY
SUBBASIN BOUNDARY
STATE BOUNDARY
COUNTY BOUNDARY
RESERVOIR AND STREAM
TOWN OVER 15,000
COUNTY SEAT
COMMON NAME
BLUEGILL BG
BUFFALO Bu
BULLHEAD BH
CARP Ca
CHANNEL CAT CC
COMMON SUCKER CS
CRAPPIE Cr
DRUM Dr
FLATHEAD CAT FHC
LARGEMOUTH BASS LMB
NORTHERN PIKE NP
PERCH Pe
RED HORSE RH
ROCK BASS RB
SAND STURGEON SS
SMALLMOUTH BASS SMB
SPOONBILL CAT SBC
SUNFISH SF
WALLEYE Wa
MINNESOTA
IOWA
STEELE
DODGE
FREEBORN
MOWER
ALBERT LEA
AUSTIN
WINNEBAGO
WORTH
MITCHELL
Northwood
Forest City
Osage
HANCOCK
CERRO GORDO
FLOYD
CHICKASAW
MASON CITY
Garner
Charles City
WRIGHT
FRANKLIN
BUTLER
BREMER
Hampton
Allison
Waverly
BLACK HAWK
BUCHANAN
HAMILTON
HARDIN
GRUNDY
CEDAR FALLS
WATERLOO
Eldora
Grundy Center
TAMA
BENTON
LINN
JONES
STORY
MARSHALL
Vinton
MARSHALLTOWN
Toledo
CEDAR RAPIDS
CEDAR
JASPER
POWESHIEK
IOWA
JOHNSON
Marengo
Coralville Lake
Tipton
SCOTT
IOWA CITY
Montezuma
MUSCATINE
DAVENPORT
MAHASKA
KEOKUK
WASHINGTON
English River
MUSCATINE
LOUISA
Washington
Wapello
HENRY
DES MOINES
BURLINGTON
Winnebago River
Shell Rock River
West Fork Cedar River
CEDAR RIVER
IOWA RIVER
MISSISSIPPI
Skunk River
Cs Cr BH NP Pe BG Ca SF Wa LMB RH
CS Pe SMB Wa BH RB Ca Cr RH SF BG LMB NP
NP LMB Ca Wa BH Cr
NP Wa SMB BG CC LMB Cr FHC Ca BH
NP Ca BH
NP BG SMB Cr CC LMB Ca BH Wa
CC BH Ca BG NP LMB Wa Cr
BH BG LMB Cr NP
CC FHC Wa LMB SMB BG Ca Cr NP Bu
CC Cr FHC BG Wa BH Ca SMB SBC SS NP
CC BG BH Cr Ca Bu FHC
CC Cr FHC NP Wa LMB BH SF
CC Wa FHC Dr BH NP Ca
Fish species listed vertically by order of abundance and importance.
MINNESOTA
IOWA
IOWA CEDAR RIVERS BASIN
SCALE 1:1,660,000
SCALE IN MILES
44°
43°
42°
41°
94°
93°
92°
91°
SOURCE
SCS DRAWING NO. 5,0-28,270 (4-74), MINNESOTA DEPARTMENT OF NATURAL RESOURCES, IOWA CONSERVATION COMMISSION AND INFORMATION FROM FIELD TECHNICIANS. LAMBERT CONFORMAL CONIC PROJECTION.
REV 11/24/75
5,N-34,945

Figure II-11

is the pheasant. A few years ago most of the pheasant population was found in the northern half of the Basin but largest numbers are now found in the southern half. Reduction of adequate cover in the north caused relocation of the pheasant population to more heavily covered areas of the south. Other game birds are ruffed grouse, turkeys, mourning doves, Wilson's snipe, and hungarian partridge.

The Basin is located in the Mississippi Flyway. Each year, thousands of waterfowl pass through the area to and from their breeding and wintering grounds. The snow and blue geese make up about 90 percent of geese found in the area, plus lesser numbers of Canada and white-fronted geese.

The northern portion is best suited for duck breeding grounds. Most of the ducks come from outside the Basin. The ducks observed in order of importance are mallard, blue winged teal, green winged teal, and pintail. Others present are canvas back, red head, gadwall, and lesser scaup.

Appendix C-1 indicates the density of selected game birds and mammals in the Basin. Appendix C-2 contains a more complete list of game animals, game birds, and fur-bearers of the Basin.

Small mammals, songbirds, reptiles, amphibians, and insects are abundant and varied. Their main value lies in being recognized by people to be part of the environment.

There are four basic habitat types in the Basin. These are composed of plant communities that provide some of the needs of wildlife.[1/] The first, cropland habitat type, is the largest and comprises over 73 percent of the Basin. Its primary function is to provide food. Grassland is the second and accounts for less than 15 percent and serves as nesting cover for a large number of species. The third, forest land, comprises about 4 percent and serves as cover, food, and shelter. Woodland consisting mainly of timbered areas and windbreaks, is most abundant in the southern portion. Important segments of the forest land grouping not adequately surveyed are the areas associated with streams. These are usually narrow and serve as travel lanes and winter shelter areas for a variety of wildlife species. Most wildlife species require an interspersion of these habitat types to maintain a viable population. Further, each species needs a mix consisting of varying amounts of each type to reach and maintain optimum population levels. The fourth

1/ Habitat types based on Conservation Needs Inventory 2 percent sample areas of land use in Iowa, 1973.

habitat type is wetland. Species such as waterfowl, mink, and muskrat are dependent upon this type for critical needs such as food, shelter, and reproduction. This type accounting for less than one percent of the Basin area contains a variety of plants. However, over one-half contain water less than half the year. Sixty-seven percent are not grazed, and provide winter shelter for several wildlife species.

The quality of each habitat type is as important as the quantity Table II-4 indicates land use by habitat and the approximate value in relation to the potential.

TABLE II-4

WILDLIFE HABITAT QUALITY

Iowa-Cedar Rivers Basin

Land Use	Basin		North		South	
	Percent of Area	Percent* of Potential	Percent of Area	Percent* of Potential	Percent of Area	Percent* of Potential
Cropland	73.3	26	81.3	23	65.7	30
Farmstead	2.4		2.4		2.3	
Hayland	3.2	21	1.5	25	4.8	20
Grassland	10.5	11	6.3	10	14.6	11
Recreation	**		**		**	
Transportation	2.7		2.8		2.6	
Forest Land	2.7	59	1.4	61	4.0	59
Urban	1.7		1.5		2.0	
Wildlife	0.7	78	0.3	51	1.0	85
Streams						
Wetlands	0.7		0.6		0.8	
Lakes & Ponds	0.2		>0.1		0.3	
Windbreaks	0.3	75	0.5	77	0.2	72
Odd Areas	0.4	81	0.4	85	0.5	77
Fence Rows	0.6		0.5		0.6	
Waterways	0.6	27	0.5	29	0.7	26
Other	>0.1		>0.1		>0.1	

* See Appendix C-3 for methodology.
** Insignificant.

The Iowa-Cedar Rivers Basin was divided into two portions having different land use and management patterns, and therefore, varying habitat values (Figure II-12). The northern portion is relatively level and best suited to row crop production. Large fields of single crops dominate the cropping patterns. There is little variety in vegetative cover. The southern portion has more variety in topography and soils. This results in a more diversified agricultural use pattern. Many different vegetative types are present. See Appendix C-4 for a description of habitat in each portion.

WILDLIFE HABITAT STUDY AREAS
IOWA-CEDAR RIVERS BASIN

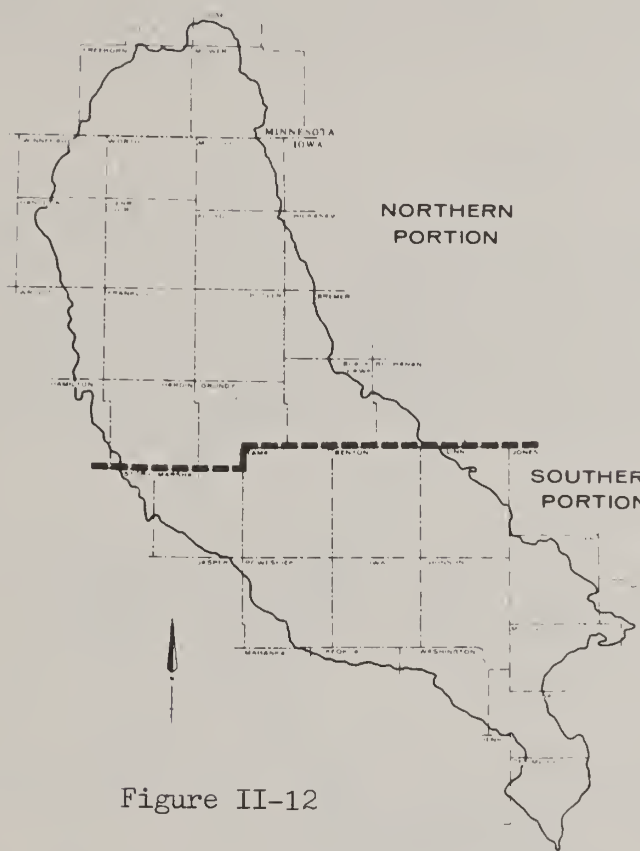


Figure II-12

G. FOREST RESOURCES

Farmers settled first in the southern portion of the Basin which contained more forests and started clearing for farms. Remaining forest land is 309,840 acres and usually associated with streams.

Commercial forest land acreage is decreasing. Sawmills and other markets for forest products have moved elsewhere or operate on a seasonal basis. Forest land in the basin has taken on new importance because of the demand for forest/stream recreation and the increasing emphasis on environmental quality. The forest land associated with the streams provides multiple benefits for fish and wildlife, recreation, esthetics, water quality and timber production.

The forest land resources are located primarily in the southern portion of the basin. Mixed stands of oak and hickory types make up 97% of the forest land. Elm-ash-cottonwood species are scattered throughout the remainder of the basin. See Chapter III for further information.

Deciduous tree windbreaks occupy five percent of the total forest land acres in the southern portion. Windbreaks provide protection to the farmsteads from wind and blowing snow. In the northern portion of the basin, 25% of all forest land is classified as windbreaks. Over half of all farmsteads have windbreaks and most of the trees are over fifteen years old.

H. RECREATIONAL RESOURCES

With an ever increasing number of people residing in urban and urbanized areas, the importance of and necessity for providing recreation facilities for this sector of our population will increase. The present recreational opportunities in the Basin are varied but inadequate. The eight major urban areas exceeding 25,000 population comprise 45 percent of the population. The density of the population in the Basin is 64 persons per square mile as compared to 50 for the State of Iowa.

1. Location and Type

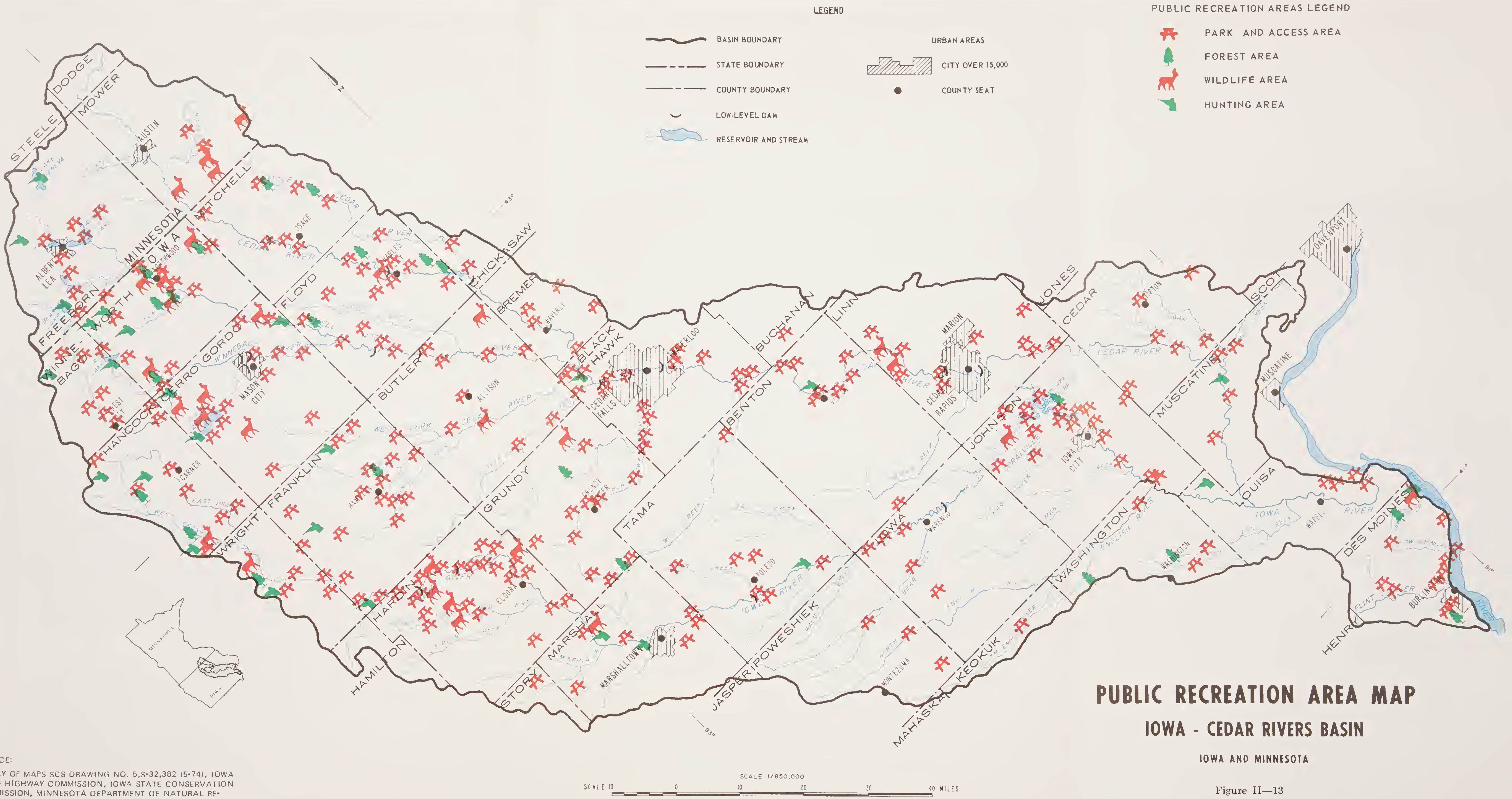
Cropland, pastureland, and urban areas account for about 92 percent of the land area. Most of the present recreation use and potential use lies within the narrow stream-associated environmental corridors.1/

The Iowa, Cedar, and Flint Rivers and their tributaries constitute an important potential recreational resource. Ownership of these streams directly affects both the amount of recreational use and kind of activities available.

At present, there are over 330 public recreation areas in the Basin including parks, wildlife management areas, and public access areas (Figure II-13). Fourteen state parks provided approximately 2.9 million visitor days in 1970. This is an increase of 29 percent since 1965.

Some of the best water based recreational opportunities in the Iowa portion are found at Clear Lake, Lake MacBride, and Coralville Lake. Clear Lake, in Cerro Gordo County, has a surface area of 3,600 acres. A summary of visitor use in 1970 showed about 176,000 persons utilized the adjoining McIntosh Woods State Park. Additional visitors, using the lake for water based activities, are difficult to estimate. Lake MacBride adjacent to Coralville Lake, has a surface area of 950 acres. This State Park provides boating, swimming, camping, and fishing opportunities. In 1967, approximately 116,000 persons visited this area. It is an intensively used facility because of its nearness to Cedar Rapids, Iowa City, and the University of Iowa. Coralville Lake, in Johnson County, is a reservoir constructed

1/ A detailed description of the recreational and related resources is available in the working files of the U.S. Forest Service, Carbondale, Illinois.



PUBLIC RECREATION AREA MAP

IOWA - CEDAR RIVERS BASIN

IOWA AND MINNESOTA

Figure II—13

SOURCE:
FAMILY OF MAPS SCS DRAWING NO. 5,S-32,382 (5-74), IOWA STATE HIGHWAY COMMISSION, IOWA STATE CONSERVATION COMMISSION, MINNESOTA DEPARTMENT OF NATURAL RESOURCES, U.S.D.A. FOREST SERVICE, AND SOIL CONSERVATION SERVICE. LAMBERT CONFORMAL CONIC PROJECTION.

USDA-SCS-LINCOLN, NEBR. 1975

2/20/75
5,S-34,950

ENVIRONMENTAL CORRIDORS

THE BASIN
HAS MANY
SCENIC
RIVER
CORRIDORS

by the U.S. Army, Corps of Engineers in 1958. The 19,300 acre flood control reservoir on the Iowa River normally provides 4,900 surface acres of water. It is estimated that 1,250,000 persons utilized the reservoir in 1971 for water related recreation activities.

Lake MacBride, in the background, is separated from Coralville Lake by an earth fill dam.

Albert Lea Lake, located in Minnesota, has a surface area of 2,625 acres. It presently has water quality problems. Helmer Myre State Park, a scenic area, is located on a peninsula in Albert Lea Lake.

Enabling legislation passed by the Iowa General Assembly in 1955, permitted the establishment of County Conservation Boards by popular vote. Each county in the Iowa portion has such a board. Minnesota does not have a comparable county level program. Appendix D-1 summarizes public recreation areas and facilities available.

Municipal governments also provide many high-density recreational opportunities. In 1970, it was estimated there were 545 municipal recreation areas in the Basin involving 7,900 acres.

Commercial recreational areas are becoming increasingly popular. Some landowners are supplementing their income by developing recreational opportunities, particularly vacation farms which attract urban residents. Some private corporations are also developing reservoirs around which it is often possible to erect summer or year-around homes. There are four commercial areas in the Basin.

There are nineteen low-level dams used primarily for power and/or recreational purposes on the Iowa, Cedar, Shell Rock, and Winnebago Rivers. The oldest dam was built in 1874 and the newest in 1966. Most were constructed between 1920 and 1950. Since many of these reservoirs are located within or adjacent to cities, present and potential recreation use is relatively high for several recreational activities. Appendix D-2 lists data pertinent to these dams and Figure II-14 shows their location.

Farm ponds occur throughout the Basin but are most prevalent in the southern portion. There are over 1,300 ponds at the present time. A breakdown according to size is as follows:

95% - 1 to 5 acres
4% - 5 to 10 acres
1% - more than 10 acres

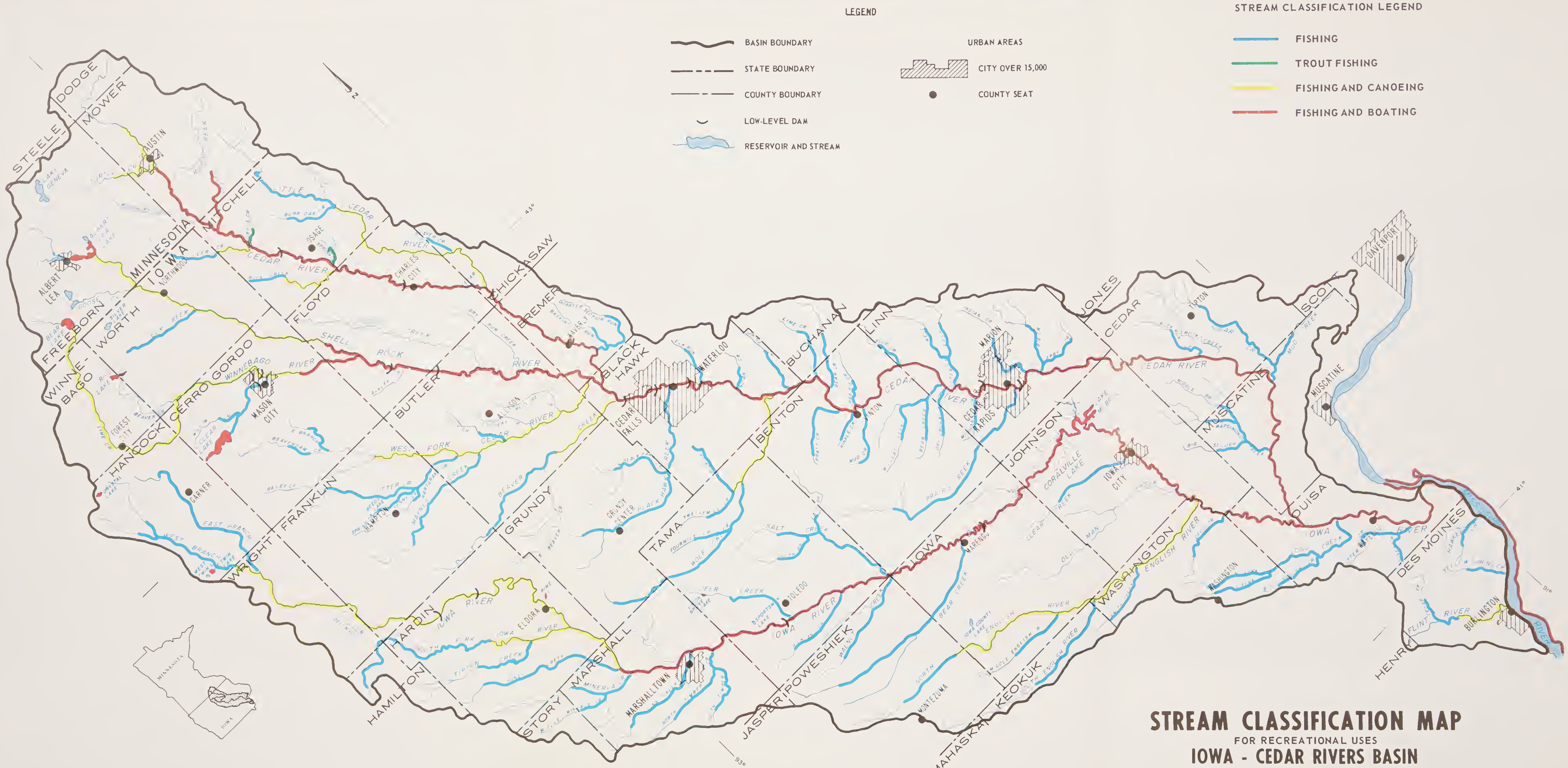
Most are used for livestock water as well as for soil and water conservation. Many are stocked with fish and most are open to the public by permission of the owner. In addition to fishing, other recreational opportunities include hunting of waterfowl and upland game.

I. ENVIRONMENTAL CORRIDORS

Environmental corridors are defined: Linear water-oriented areas reserved for managed use, left in or developed to a condition that can enhance mans environment by maintaining or creating scenic beauty, wildlife habitat, natural areas, open space, recreational opportunities, flood hazard reduction, water quality improvement, and other desirable features in total or in any part.

Most of the corridor related recreation takes place on or near the streams. Figure II-15 shows the most popular types of stream recreation activities. These classifications depict general conditions for the individual streams.

U. S. DEPARTMENT OF AGRICULTURE



STREAM CLASSIFICATION MAP

FOR RECREATIONAL USES

IOWA - CEDAR RIVERS BASIN

IOWA AND MINNESOTA

SCALE 1/850,000

SCALE 10 0 10 20 30 40 MILES

Figure II—14

SOURCE:

FAMILY OF MAPS SCS DRAWING NO. 5,S-32,382 (5/74).
IOWA STATE HIGHWAY COMMISSION, IOWA STATE CONSERVATION COMMISSION, MINNESOTA DEPARTMENT OF NATURAL RESOURCES, U.S.D.A. FOREST SERVICE AND SOIL CONSERVATION SERVICE.
LAMBERT CONFORMAL CONIC PROJECTION.

USDA-SCS-LINCOLN, NEBR 1975

2/3/75
5,0-34,951

ENVIRONMENTAL CORRIDORS
IOWA - CEDAR RIVERS BASIN
IOWA AND MINNESOTA

Figure II—15

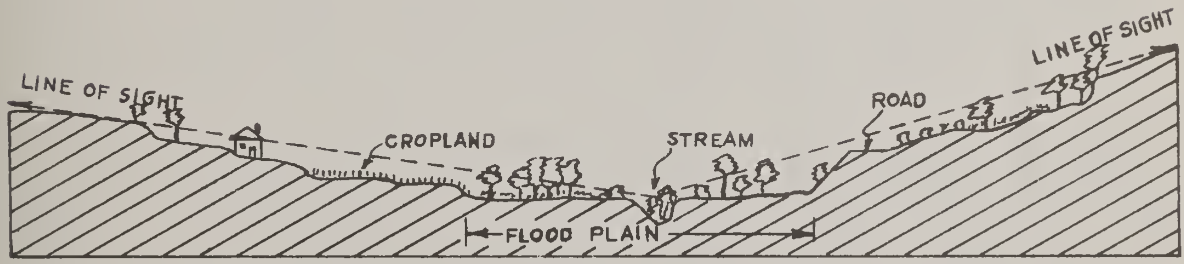
SOURCE: FAMILY OF MAPS SCS DRAWING NUMBER 5,S-32,382 (REV. 5-15-74) IOWA CONSERVATION COMMISSION, MINNESOTA DEPARTMENT OF NATURAL RESOURCES, IOWA NATURAL RESOURCES COUNCIL, USDA SOIL CONSERVATION SERVICE, AND USDA FOREST SERVICE.

USDA-SCS-LINCOLN, NEBR. 1974

5-20-74
5,S-34,250

The States of Iowa and Minnesota participated in the delineation of the environmental corridors. Those streams and lakes, with the related lands around them, were determined to have local or regional significance from an environmental standpoint. The location and extent of the Basin's corridors are shown in Figure II-15. The exterior boundaries comprise a substantial area within the Basin.

The broad land uses within the corridors and the related stream mileages are shown in Table II-5. The corridors comprise 22 percent of the basin. The corridor includes both near view and far view landscapes to the top of the surrounding ridges as seen from the stream (See schematic drawing). Approximately 50 percent of existing forest land is located within the corridors. In most sections of the Basin, these corridors include the only remaining forest land.



of the steamboats were gone from the Basin. The growth of the railroads was greatest from 1880 to 1890. Their main cargo was was grain and coal.

Grain production is a major industry in the Basin. As early as 1886, the oatmeal industry was centered in this area with plants at Cedar Rapids, Iowa City, and Cedar Falls. In 1888, the Cedar Rapids and Iowa City companies joined an oatmeal trust which became the Quaker Oats Company in 1901. Livestock production has also been an important activity.

Development in the Basin has been characterized by increasing production rather than changes in types of industries. This increased production from agricultural and nonagricultural industries has firmly established the Basin as an economically important area.

B. ECONOMIC INDICATORS

1. Population

The population of the economic area1/ increased nearly 18 percent between 1950 and 1970 (Figure III-1). In comparison, the population of Iowa increased less than 8 percent during this period while Minnesota increased almost 28 percent (Figure III-2). Most of the increase in the area's population occurred in the period 1950 to 1960 (11 percent). The remaining 10 years showed an increase of 7 percent in the Iowa counties and a decrease of 6 percent in the Minnesota counties. Changes in population by counties during the last two decades are shown in Appendix Table B-3. Black Hawk and Linn counties had the only net in-migration during the period 1950-60. During the 1960-70 period, the four counties of Johnson, Linn, Marshall and Muscatine had net in-migration. The natural increase in population compensated for the out-migration in 17 of 25 counties during 1950-60, but only in 9 counties during 1960-70.

Counties with large urban populations increased in total population from 1960 to 1970 except for Cerro Gordo and Mower. Cerro Gordo had an urban population of 36,809, 75 percent of its total, but its population decreased by 671 people. Mower had an urban population of 25,074, 57 percent of its total, and its population decreased by 4,715. During the same period, Johnson, Linn, and Black Hawk which contain the cities of Iowa City, Cedar Rapids, and Waterloo, respectively, had a combined increase exceeding the net change in population for the entire Basin.

The 28 largest urban centers in the economic area are listed in Table III-1. All except Albert Lea and Muscatine are located near one of the main stem rivers of the Basin. The location of these cities along the main stems indicates the historical importance of the rivers to

1/ Economic area is a "county boundary" delineation of the hydrologic basin. The counties included are shown in Figure III-3. The population of the hydrologic basin is discussed in Chapter I.

ECONOMIC AREA POPULATION TRENDS
IOWA-CEDAR RIVERS BASIN

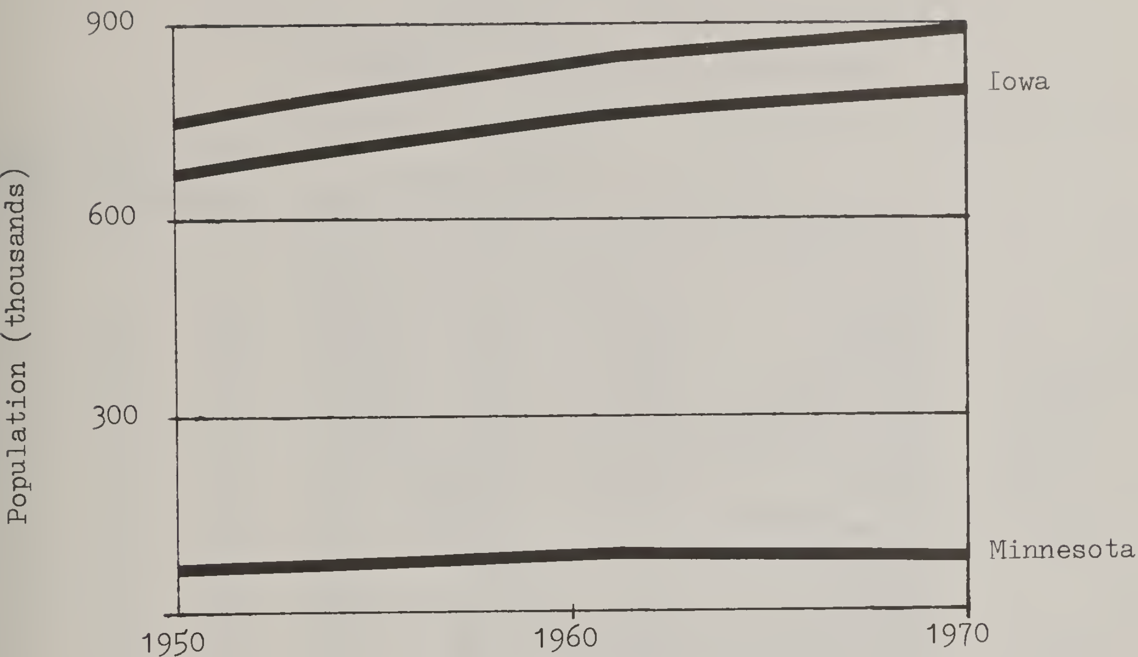


Figure III-1

STATE POPULATION TRENDS
IOWA-CEDAR RIVERS BASIN

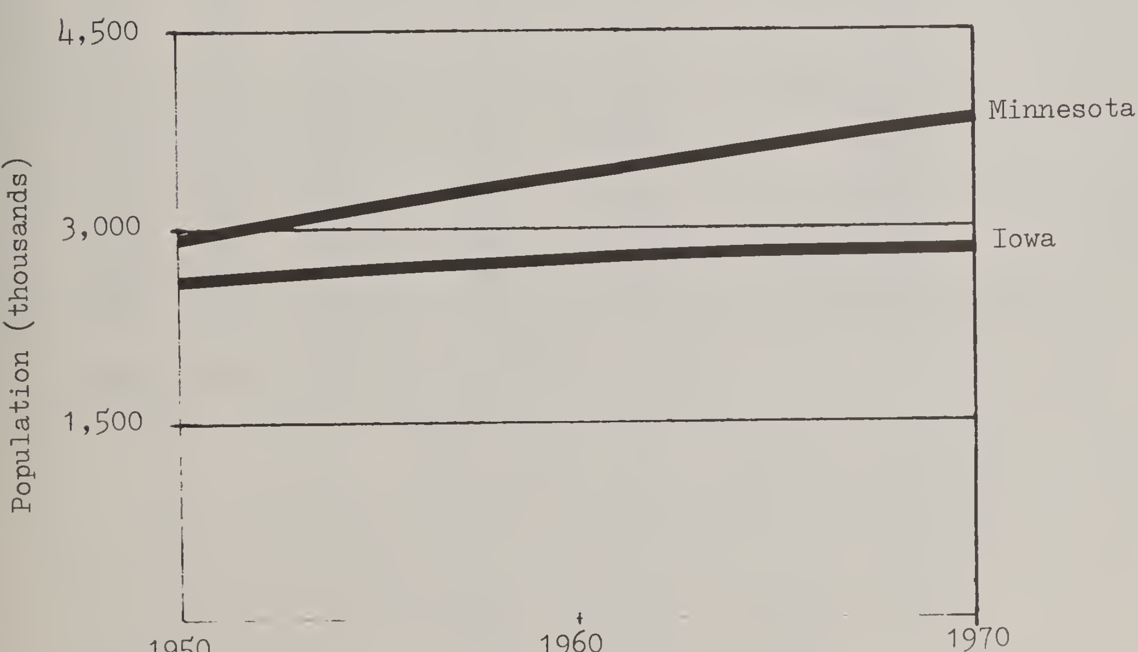


Figure III-2

TABLE III-1

POPULATION OF PRINCIPAL COMMUNITIES, 1950-1970

Iowa-Cedar Rivers Basin Economic Area

City	County	Population			Population Increase Index = 1950		
		1950	1960	1970	1950	1960	1970
Albert Lea	Freeborn	13,545	17,108	19,418	100	126.3	143.4
Austin	Mower	23,100	27,908	25,074	100	120.8	108.5
Belle Plaine	Benton	3,056	2,923	2,810	100	95.6	91.9
Burlington	Des Moines	30,613	32,430	32,366	100	105.9	105.7
Cedar Falls	Black Hawk	14,334	21,195	29,597	100	147.8	206.5
Cedar Rapids	Linn	72,296	92,035	110,642	100	127.3	153.0
Charles City	Floyd	10,309	9,964	9,268	100	96.7	89.9
Clear Lake	Cerro Gordo	4,977	6,158	6,430	100	123.7	129.2
Coralville	Johnson	977	2,357	6,130	100	241.2	627.4
Eldora	Hardin	3,107	3,225	3,223	100	103.8	103.7
Evansdale	Black Hawk	3,571	5,738	5,038	100	160.7	141.1
Forest City	Winnebago	2,766	2,930	3,841	100	105.9	138.9
Grundy Center	Grundy	2,135	2,403	2,712	100	112.5	127.0
Hampton	Franklin	4,432	4,501	4,376	100	101.6	98.7
Iowa City	Johnson	27,212	33,443	46,850	100	122.9	172.2
Iowa Falls	Hardin	4,900	5,565	6,454	100	113.6	131.7
Marion	Linn	5,916	10,882	18,028	100	183.9	304.7
Marshalltown	Marshall	19,821	22,521	26,219	100	113.6	132.3
Mason City	Cerro Gordo	27,980	30,642	30,379	100	109.5	108.5
Mt. Vernon	Linn	2,320	2,593	3,018	100	111.8	130.1
Muscatine	Muscatine	19,036	20,997	22,405	100	110.3	112.4
Osage	Mitchell	3,436	3,753	3,815	100	109.2	111.0
Tama	Tama	2,930	2,925	3,000	100	99.8	102.4
Tipton	Cedar	2,633	2,862	2,877	100	108.7	109.3
Vinton	Benton	4,307	4,781	4,845	100	111.0	112.5
Waterloo	Black Hawk	65,198	71,755	75,533	100	110.1	115.9
Waverly	Bremer	5,124	6,357	7,205	100	124.1	140.6
West Burlington	Des Moines	1,614	2,560	3,139	100	158.6	194.5
Total		381,645	452,511	514,692	100	118.6	134.9

Source: U.S. Bureau of Census, 1950, 1960, 1970.

ECONOMIC STUDY AREA

IOWA-CEDAR RIVERS BASIN

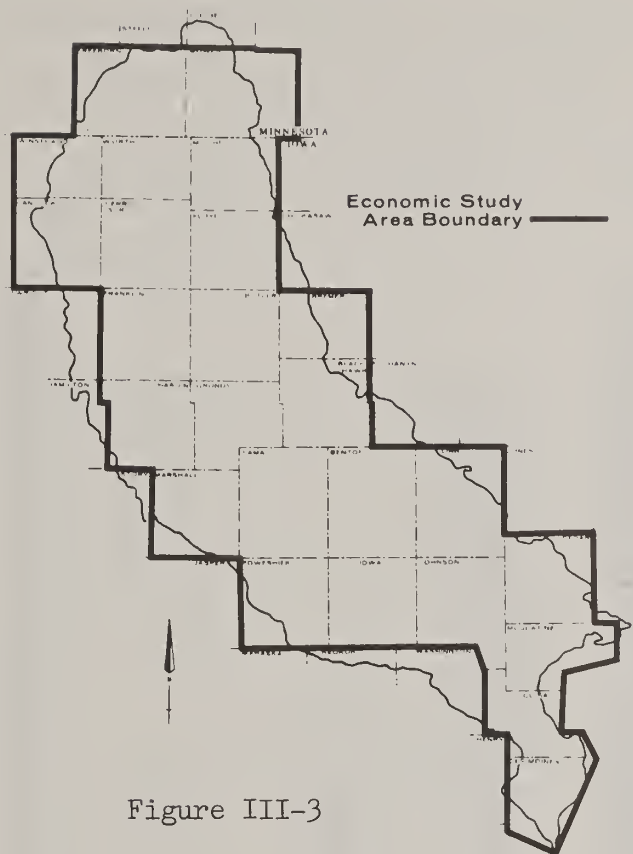


Figure III-3

the economy. Approximately [illegible]0 percent of the economic area's total population reside in the 11 largest urban centers. Other population centers outside the economic area which have an important impact on its economy, include Davenport, population 100,000, on the southeastern tip, and the Des Moines metropolitan area on the west, population over 250,000.

Population of the Iowa-Cedar economic area by place of residence is shown in Table III-2. Forty-one percent of the area's population live in rural areas. The breakdown of rural population shows that 39 percent live on farms, 39 percent reside in rural cities of less than 2,500 people, and 22 percent neither live on farms, as defined by the census, nor within city limits.

The distribution of population by age groups remained somewhat constant from 1950 to 1970 for all groups except the 5-20 year age group which increased substantially (Figure III-4). The under 5 years and the 30-44 age groups registered declines during the period.

TABLE III-2

POPULATION BY PLACE OF RESIDENCE, 1970

Iowa-Cedar Rivers Basin Economic Area

Population Classification	Number of Towns	Population	Percentage Distribution
Rural Farm:		142,898	16.1
Rural Nonfarm:			
Not in Towns	--	82,762	9.3
Less than 500	103	26,212	2.9
500 - 999	59	43,201	4.9
1,000 - 1,499	25	31,577	3.5
1,500 - 1,999	9	15,593	1.8
2,000 - 2,499	9	20,188	2.3
Total	205	219,533	24.7
Total Rural		362,451	40.8
Urban:			
2,500 - 4,999	12*	40,017	4.5
5,000 - 10,000	7	48,927	5.5
10,000 - 19,999	2	37,446	4.25
20,000 - 29,999	4	103,295	11.65
30,000 - 39,999	2	62,745	7.1
40,000 - 50,000	1	46,850	5.2
Over 50,000	2	186,175	20.9
Total Urban	29	525,455	59.2
Total Rural & Urban		887,886	100.0

Source: U.S. Bureau of Census, 1970.
Iowa Annual Farm Census, 1969 (pp. 10-11).
Minnesota Agricultural Statistics, 1970 (p. 89).

*Towns and parts of towns.

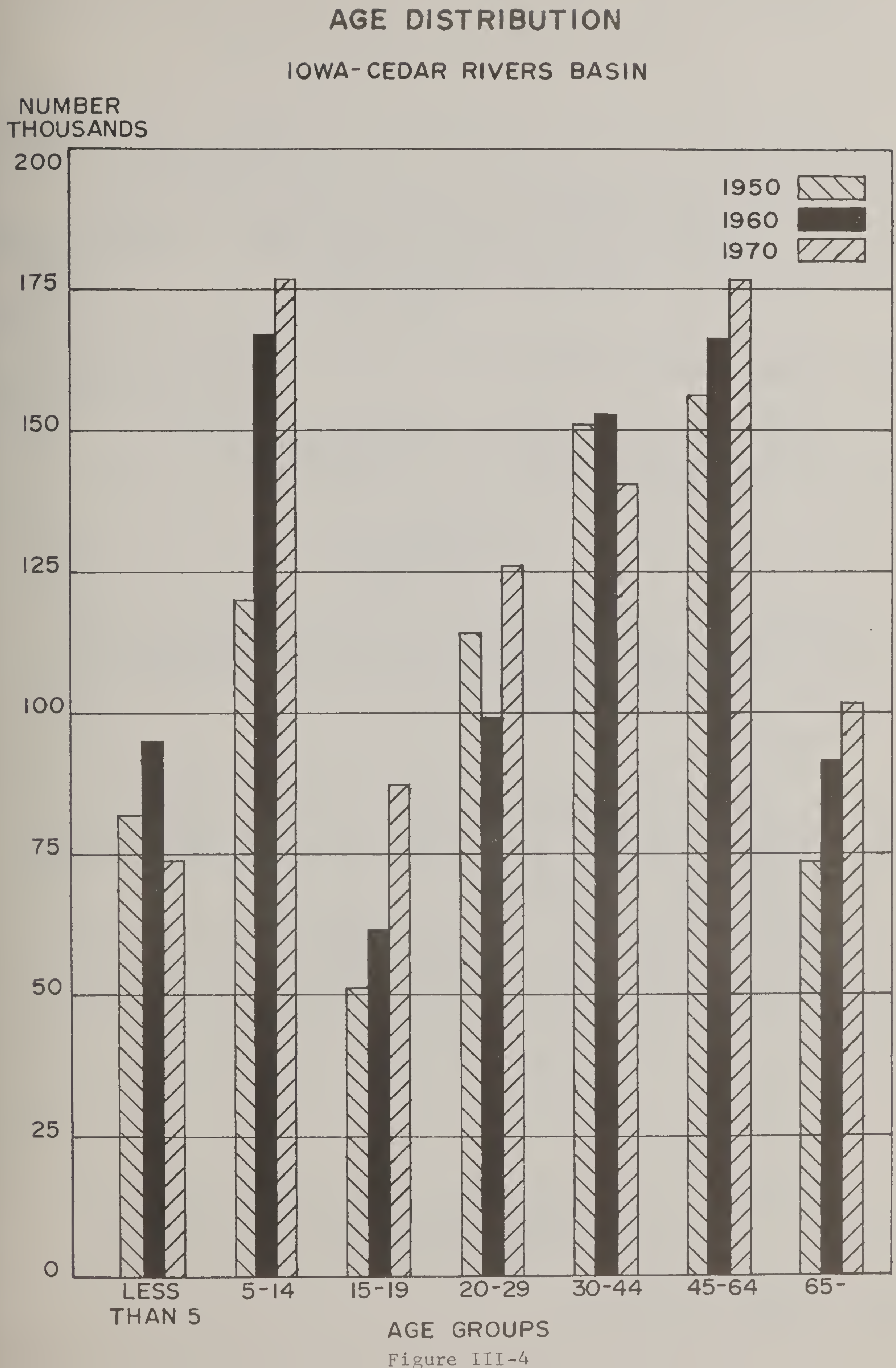

AGE DISTRIBUTION
IOWA-CEDAR RIVERS BASIN
NUMBER THOUSANDS
200
175
150
125
100
75
50
25
0
1950
1960
1970
LESS THAN 5
5-14
15-19
20-29
30-44
45-64
65-
AGE GROUPS

Figure III-4

2. Social Structures and Institutional Arrangements

Social and institutional arrangements reflect the basic agricultural foundation. Generally, communities are small and comprised of individuals with common ethnic, social, and economic interests. Civic, religious, educational, and social organizations are active in the communities. Some communities have a high degree of stability with generation after generation living on the same land. Other communities are faced with decreasing population and loss of economic vitality primarily through rural out-migration.

Local governmental activity centers around the county seat. The county seat is often the largest city in a county and usually the county's trade center.

The location of each area school and college or university in the Basin is shown in Figure III-5. Schools of higher learning include Coe College at Cedar Rapids; Cornell College at Mount Vernon; Grinnell College at Grinnell; Mount Mercy College at Cedar Rapids; University of Iowa at Iowa City; University of Northern Iowa at Cedar Falls; Wartburg College at Waverly; Waldorf College at Forest City; Lea College at Albert Lea; and Austin State Junior College at Austin. Area community colleges are distributed throughout the Basin. These include North Iowa Area Community College at Mason City, Merged Area-VI Community College at Marshalltown, Hawkeye Institute of Technology at Waterloo, Kirkwood Community College at Cedar Rapids, Southeastern Community College at Burlington, and Austin Area Vocational-Technical School at Austin.

3. Employment

Total employment in the economic area increased 7 percent from 1950 to 1960 and 12 percent from 1960 to 1970, (Appendix Table B-4). Manufacturing, wholesaling and retailing, and agriculture were the three largest sources of employment in 1970, respectively, with over 50 percent of total employment (Figure III-6).

Manufacturing registered the largest increase in number employed during the 1950 to 1970 period, while agricultural employment dropped by almost one-half. The greatest increase in employment percentagewise for this period was the category of finance, insurance and real estate. Education recorded a 60 percent increase in employment between 1960 and 1970.

C. NONFARM SECTOR

1. Manufacturing

A breakdown of the various types of firms included under the census classification of manufacturing is shown in Figure III-7. The largest segment is food and kindred products even though it declined by over one-third between 1958 and 1967 (Appendix Table B-5). Food and kindred

INSTITUTIONS OF HIGHER LEARNING
IOWA-CEDAR RIVERS BASIN

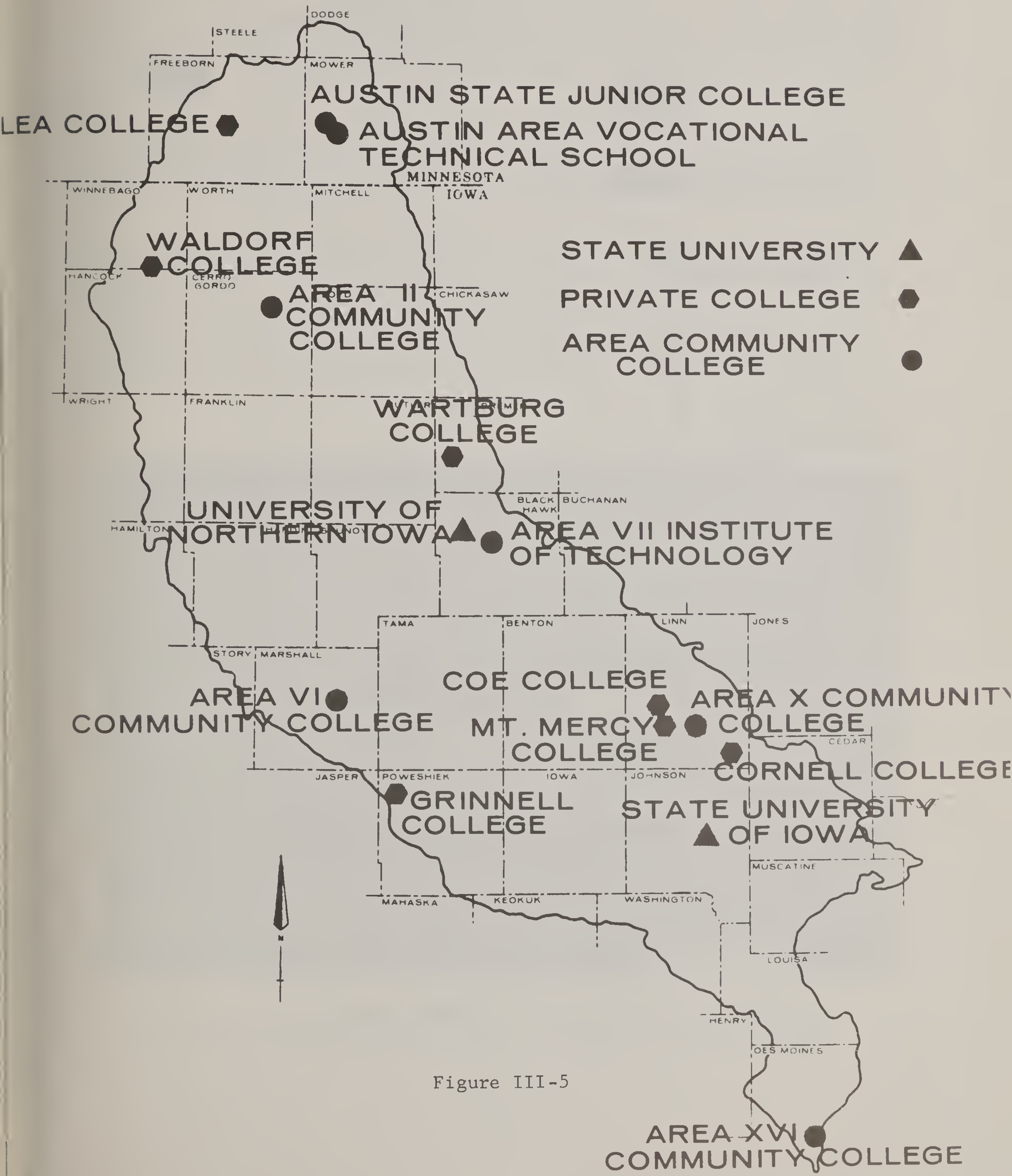
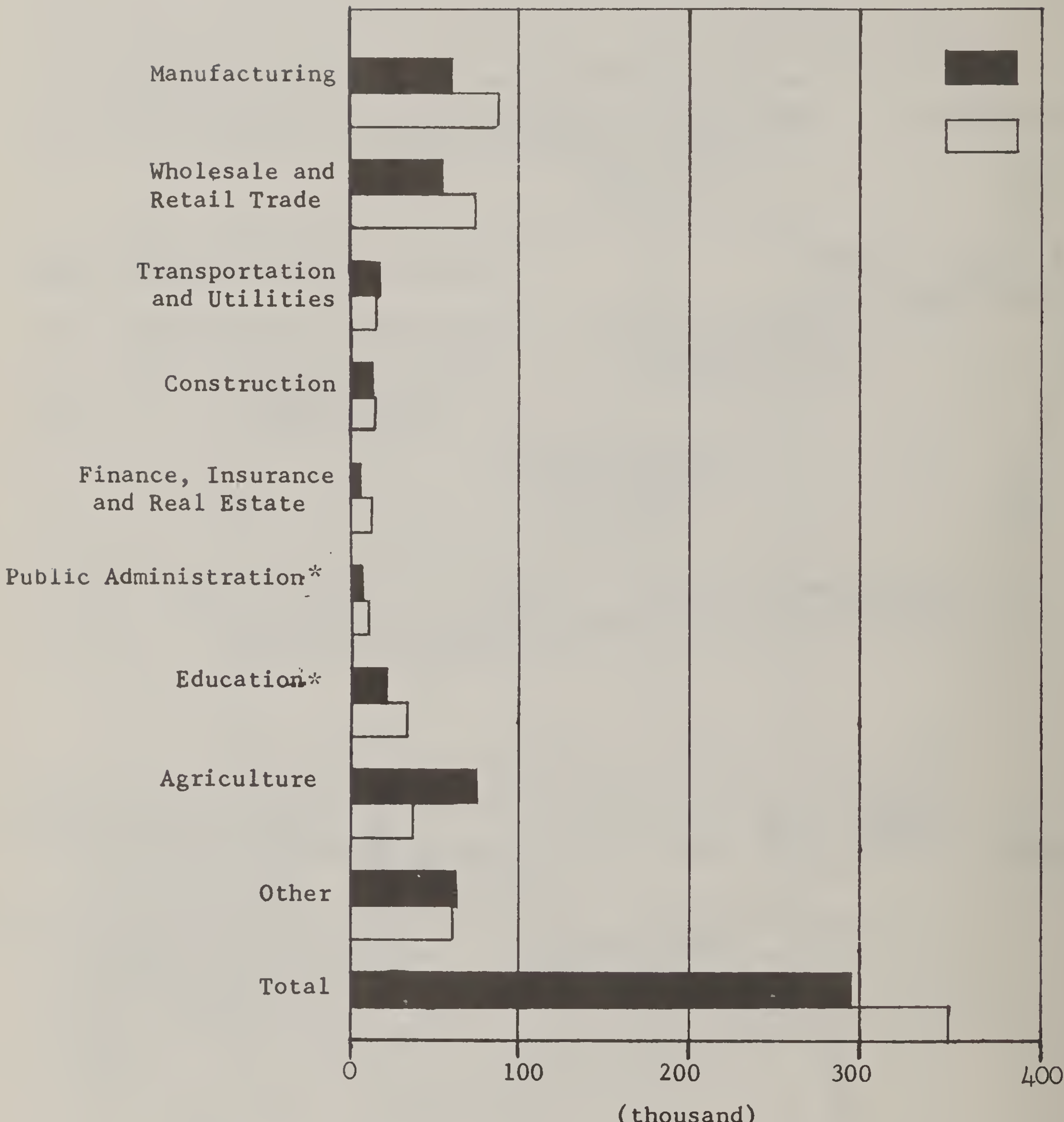


Figure III-5

EMPLOYMENT BY INDUSTRIAL AND BUSINESS GROUPING
ECONOMIC AREA
IOWA-CEDAR RIVERS BASIN



*1950 data were not available. 1960 data used instead.

Figure III-6.

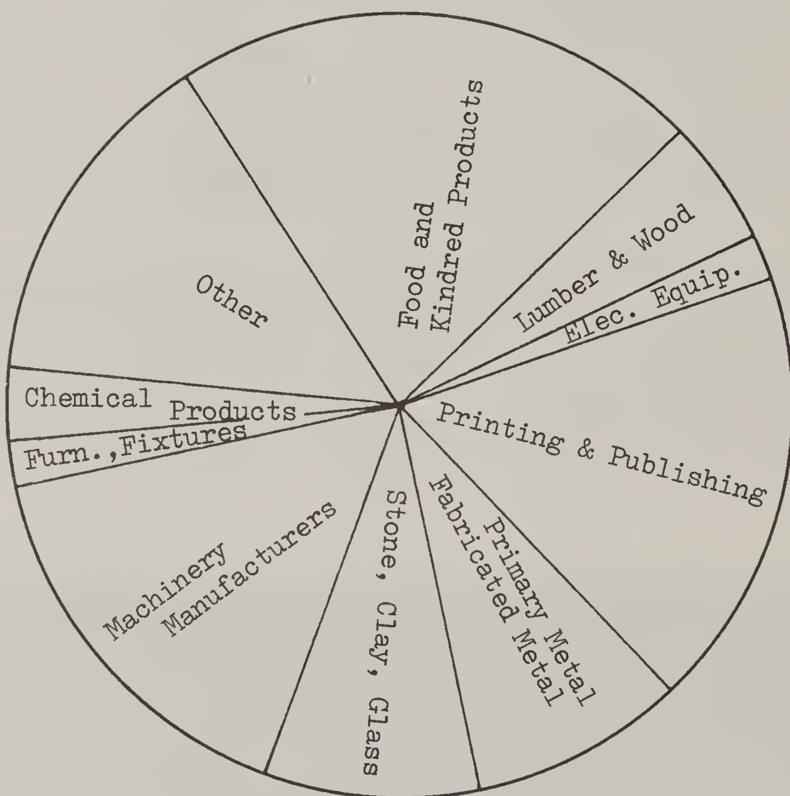
products is followed closely in number of firms by printing and publishing, and machinery manufacturers. The latter also showed the greatest increase in firm numbers with almost a 50 percent increase between 1958 and 1967. Data on the Iowa portion of the economic area from the Iowa Development Commission indicate the same trends have continued, except that primary metal and fabricated metal has increased while printing and publishing firms have declined (Appendix Table B-6).

While the number of firms decreased slightly between 1958 and 1967, the net value of production almost doubled (Appendix Table B-7). Breaking this period into two parts shows an increase of nearly 29 percent for the first half and 45 percent for the last half.

Linn and Black Hawk Counties rank first and second, respectively, in manufacturing, both in number of firms and value added (Appendix Table B-5 & 7). In 1967, 19 percent of the total number of firms were located in Linn County. These accounted for $421.8 million in value added or 31 percent of the total value added for the economic area. Black Hawk County accounted for 15.6 percent of the total number of firms and almost 23 percent of the total value added by all firms.

Industry is an important economic factor in the Basin. Quaker Oats plant, largest in the world, lies next to the Cedar River in Cedar Rapids, Iowa.

DISTRIBUTION OF MANUFACTURING FIRMS IN 1967,
ECONOMIC AREA,
IOWA-CEDAR RIVERS BASIN



Source: Census of Manufacturers

Figure III-7.

2. Wholesale and Retail Trade

The number of wholesale trade establishments in the economic area remained constant between 1963 and 1967 at 1,698 firms which was a decrease of 54 establishments from 1958. Sales have steadily increased since 1958. Sales volume increased 10 percent between 1958 and 1963, and was followed by almost a 20 percent increase during the next four years. The volume of sales occurring in each county was proportionate to the county population with Linn, Cerro Gordo and Black Hawk Counties accounting for nearly one-half of all the wholesale trade in 1967.

A breakdown of the various types of firms included under the classification of retail establishments is shown in Figure III-8. Eating and drinking establishments is the largest segment followed by service stations and food stores. A consistent decline in numbers has been registered for the categories of building materials, hardware and farm implements; food stores; and apparel and accessories stores. Generally, the total number of retailers declined between 1958 and 1963 but increased slightly between 1963 and 1967 (Appendix Table B-8). The location of the establishments by county varies directly with the population, thus, Linn and Black Hawk Counties account for 26 percent of the total firms in the economic area of the Basin.

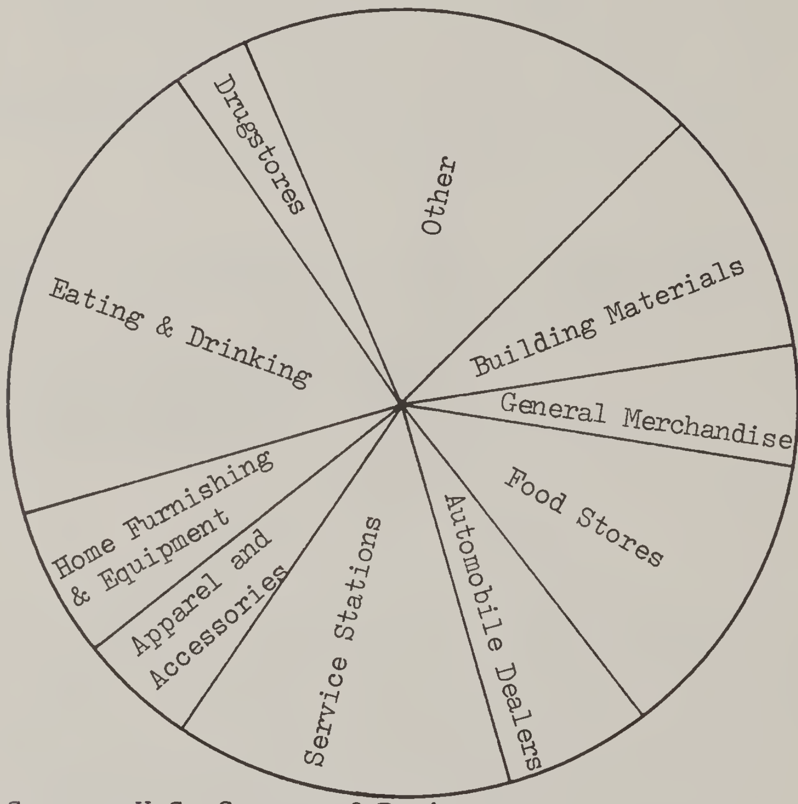
Retail sales have shown a steady rise in the decade from 1958 to 1967 (Figure III-9). A $150 million increase in retail sales occurred between 1958 and 1963, followed by another increase of $380 million by 1967--a 50 percent increase for the period (Appendix Table B-9). Food stores have led the retail industry during the entire period 1958 to 1967 followed by automobile dealerships. The retail category showing the highest increase in sales was general merchandise which more than doubled during the period. Total sales receipts, like firm location, varies directly with the population. Linn and Black Hawk Counties accounted for almost one-third of total retail sales in 1967. Johnson and Cerro Gordo registered another 14 percent for the same period.

3. Transportation

Transportation facilities include highways, airlines, and railroads. The principal north-south highways are U.S. 69, 65, 63, 218, and 61. North-south Interstate 35 is located in the upper western portion. Major east-west highways are Iowa 9, 92, and 3; Interstate 80; and U.S. 16, 18, 20, and 30. Interstate 90 crosses the upper part of the Basin in Minnesota. Additional State and county highways serve to connect these principal highways.

Airline transportation by Ozark Airlines is available in the cities of Mason City, Waterloo, Cedar Rapids, and Burlington. United Airlines also serves Cedar Rapids. Railroad passenger service by Amtrak is provided only at the city of Burlington. Important railroads moving freight into and through the Basin are the Chicago, Rock Island and Pacific Railroad;

DISTRIBUTION OF RETAIL ESTABLISHMENTS
IN 1967, ECONOMIC AREA,
IOWA-CEDAR RIVERS BASIN



Source: U.S. Census of Business

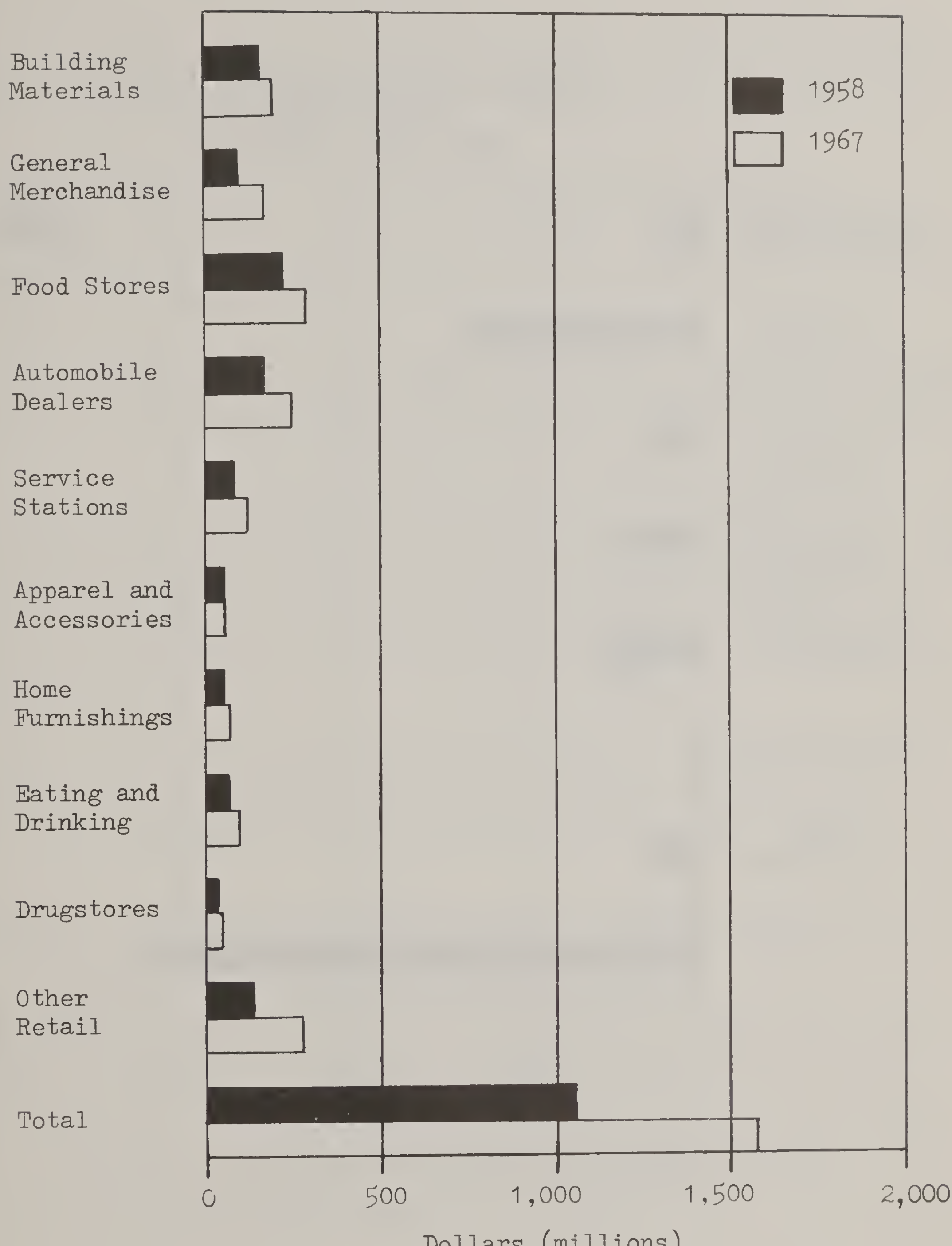
Figure III-8.

Chicago, Milwaukee, St. Paul and Pacific Railroad; Chicago and Northwestern Railway; Burlington Northern Incorporated Railroad; Illinois Central Railroad; Cedar Rapids and Iowa City Railway; Waterloo Railroad; and the Iowa Terminal Railroad.

4. Selected Services

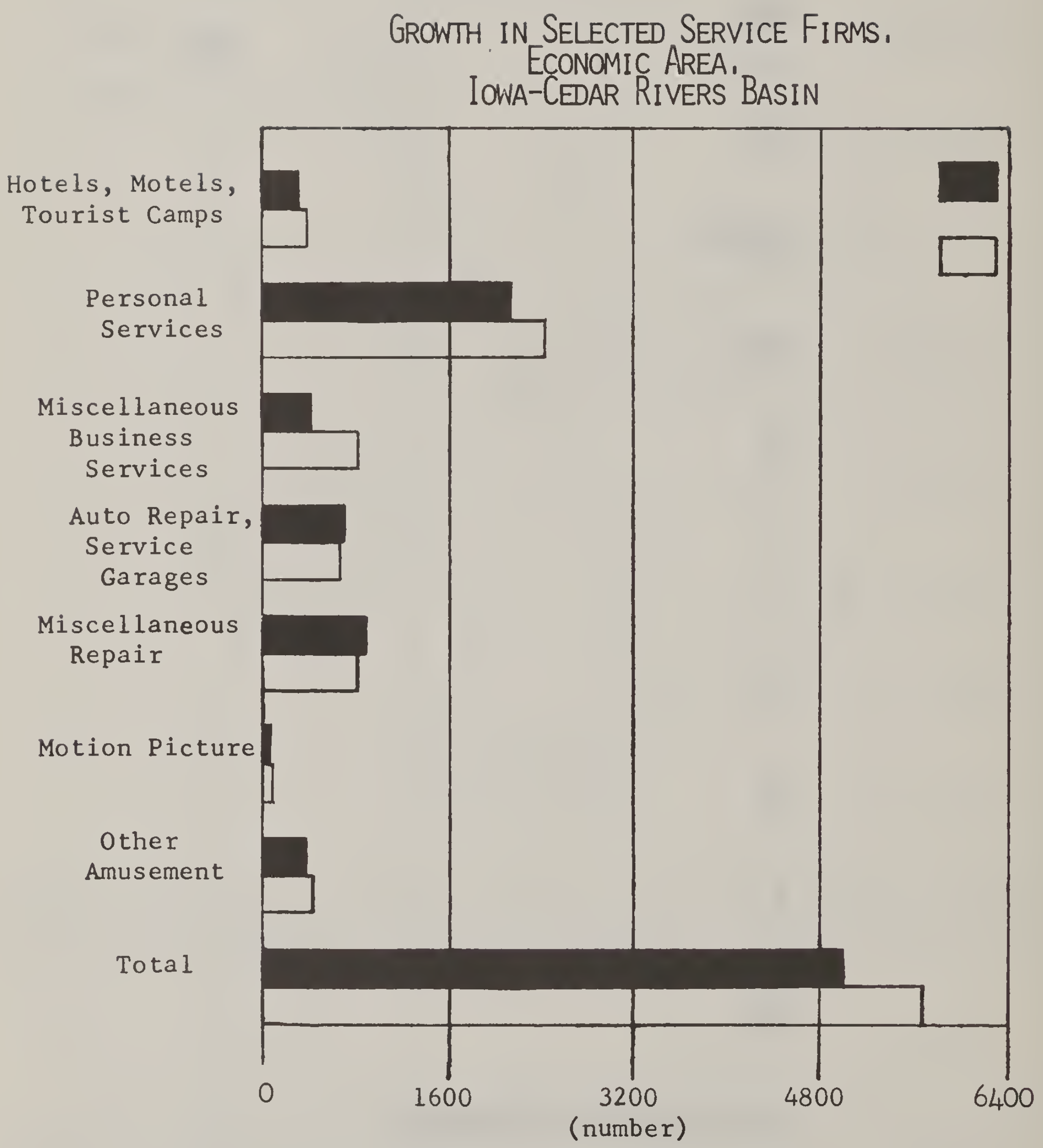
The services industry has been growing as indicated by the 14 percent increase in the number of firms shown in Figure III-10. The personal services section dominated the number of firms and accounted for 43 percent in 1967 (Appendix Table B-10). The highest increase occurred in the miscellaneous business service section which almost doubled in number from 1963 to 1967. The number of firms in repair service was down, the only section to show a decrease. Income increased 26 percent from \$121.3 million in 1963 to \$152.3 million in 1967.

RETAIL SALES, ECONOMIC AREA
IOWA-CEDAR RIVERS BASIN



Source: U.S. Census of Business

Figure III-9.



Source: U.S. Census of Business

Figure III-10.

D. THE AGRICULTURAL SECTOR

1. Number and Size of Farms

Technological advances in agriculture have allowed the individual farmer to till more acres and to produce more per acre than in the past. Subsequently, the average farmer has more than tripled the number of people he supplied with food from 14 in 1950 to 47 in 1970.[1/]

Total number of farms in the economic area decreased from 51,086 in 1954 to 37,156 in 1969 (Figure III-11). The average annual decrease in number of farms was about two percent during that period. Part of the reduction in farm numbers was due to revision of the definition of a farm by the Census Bureau in 1959.

The consolidation of farms into larger units is shown by the increase in farm size, from 166 acres in 1954 to 225 acres in 1969. This difference represents a 35 percent increase in farm size. The trend of consolidation into larger and more economical units is expected to continue.

Of the 37,156 farms in 1969, 90 percent are classified as commercial (Appendix Table B-11). Commercial farms are divided into six classes and include farms with value of sales amounting to $2,500 or more, except institutional farms and Indian reservations. Farms with value of sales of $50 to $2,499 were included in commercial farms if the operator was under 65 years of age and did not work off the farm 100 or more days. A breakdown of the distribution of commercial farms by class is illustrated in Figure III-12.

The number of noncommercial[2/] farms which consists of part-time, part-retirement, and abnormal farms remained rather constant between 1950 and 1969 (Appendix Table B-11). They constitute about 10 percent of all farms. The abnormal farms are fewest in number with only 15 in 1969.

1/ Changes in Farm Production and Efficiency, A Summary Report, 1972. Summary Bulletin No. 233, ERS, USDA.

2/ The Bureau of Census defines part-time farms as those having a value of farm sales of $50 to $2,499 and a farm operator under 65 years of age who worked off the farm at least 100 days during the census year. Part-retirement farms have a value of farm sales of $50 to $2,499 and an operator at least 65 years old. Abnormal farms include institutional farms, experimental and research farms, and Indian reservations. Institutional farms include those operated by hospitals, penitentiaries, schools, grazing associations, government agencies, etc.

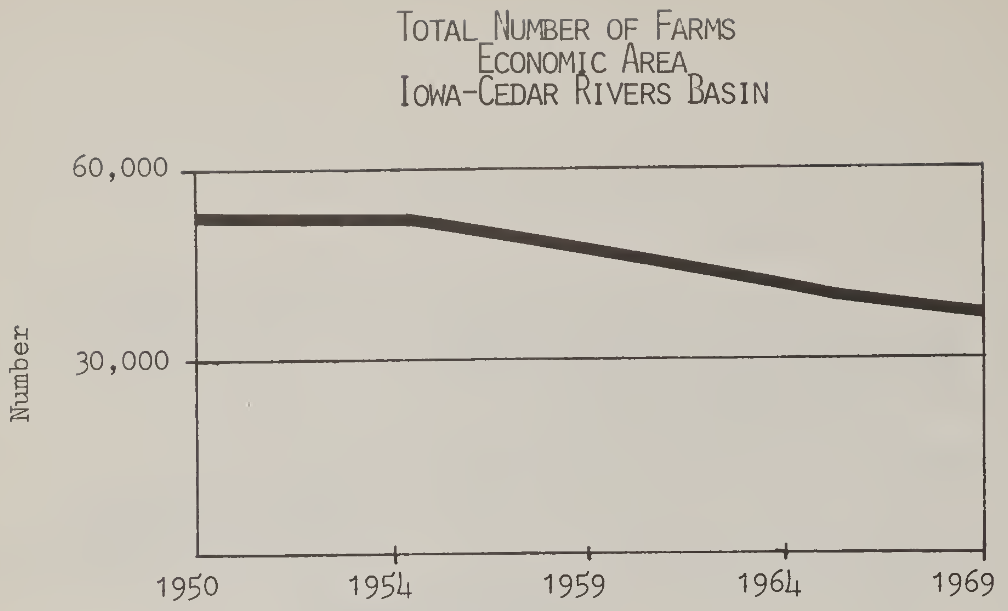


Figure III-11

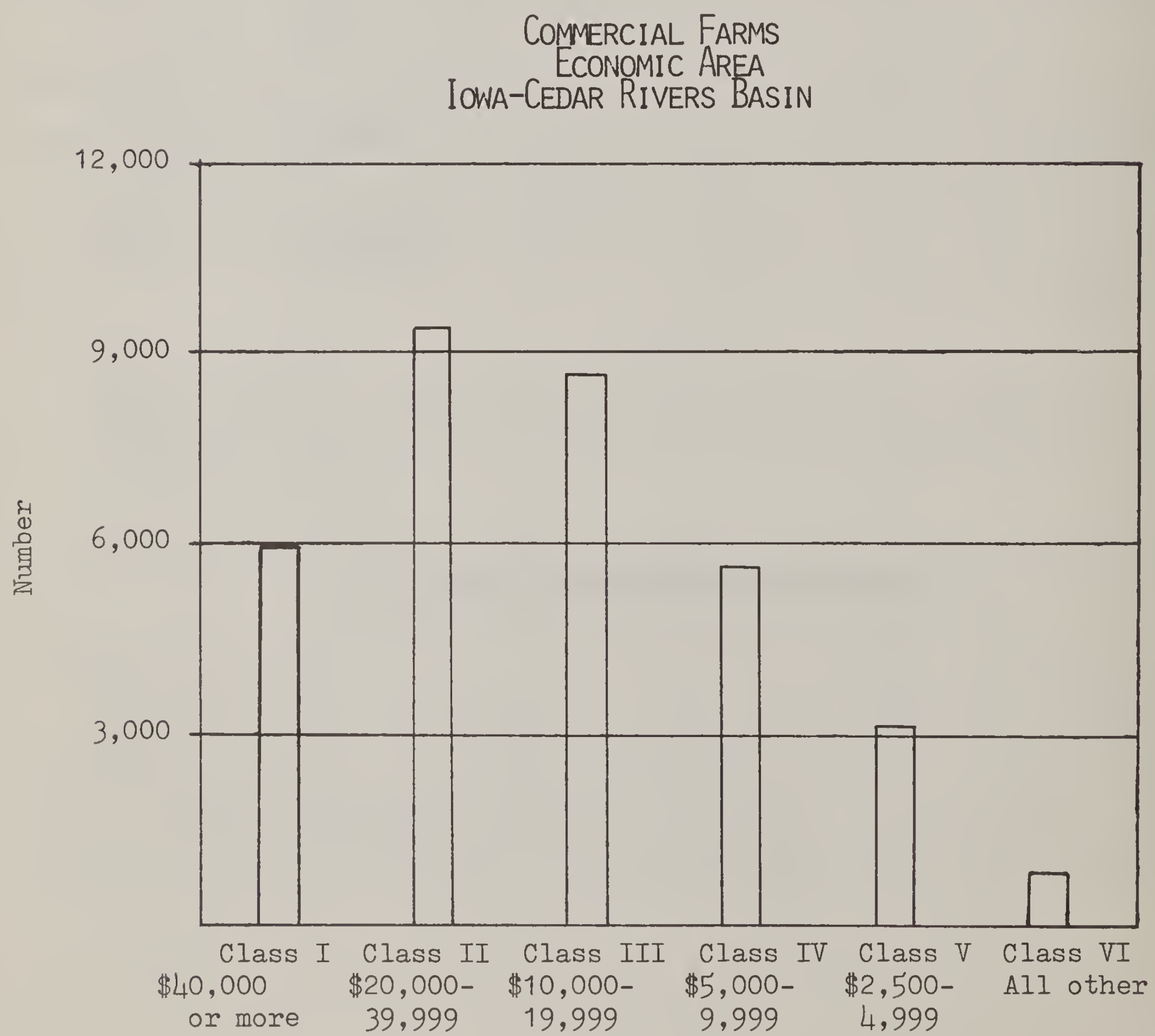


Figure III-12

2. Type of Farming

The Basin's land area is almost entirely in farms. The land used for cropland represents about 79 percent of the total area. Pasture and forest land account for an additional 8 percent and 4 percent, respectively. Cash grain farming is the dominant agricultural enterprise in the northern half of the Basin. Forage production and livestock enterprises are more important in the southern half.

Farms receiving over one-half their income from livestock are the predominant type in the economic area (Figure III-13). Beef cattle, hog and sheep farms account for 45 percent of the total farms in 1964, down from 52 percent of all farms in 1954 and 1959. Dairy farms registered a 68 percent increase in numbers between 1954 and 1964, while poultry farms decreased by 49 percent during this period.

TYPE OF FARMS, 1969. CLASS I TO V FARMS ONLY. ECONOMIC AREA. IOWA-CEDAR RIVERS BASIN

Source: Agricultural Census 1969

Figure III-13.

Cash grain farms are the second largest in number of farms. They accounted for 23 percent of the total farms in 1964 and their proportion increased three percent from 1954. Approximately 29 percent of Class I through V farms in 1969 were cash grain farms.

Agricultural production contributed $909.9 million to the economy of the economic area in 1969 (Appendix Table B-12). Livestock and livestock products contributed 73 percent and crops 27 percent of the totals (Figure III-14).

3. Fertilizer and Chemical Use

The use of commercial fertilizers and agricultural chemicals is a means by which farm operators increase production without expanding the size of operation. Pesticides have, in certain instances, taken the place of hired labor. Fertilizers and chemicals have become a very important input to agriculture.

Fertilizer use increased 145 percent between 1954 and 1969 (Appendix Table B-13). The use of lime increased only two percent during the same period.

Corn and soybeans were planted on almost 90 percent of the acres fertilized and used slightly more than 90 percent of the fertilizer. The fertilizer application rate for corn increased 121 percent. For soybeans, the rate remained unchanged.

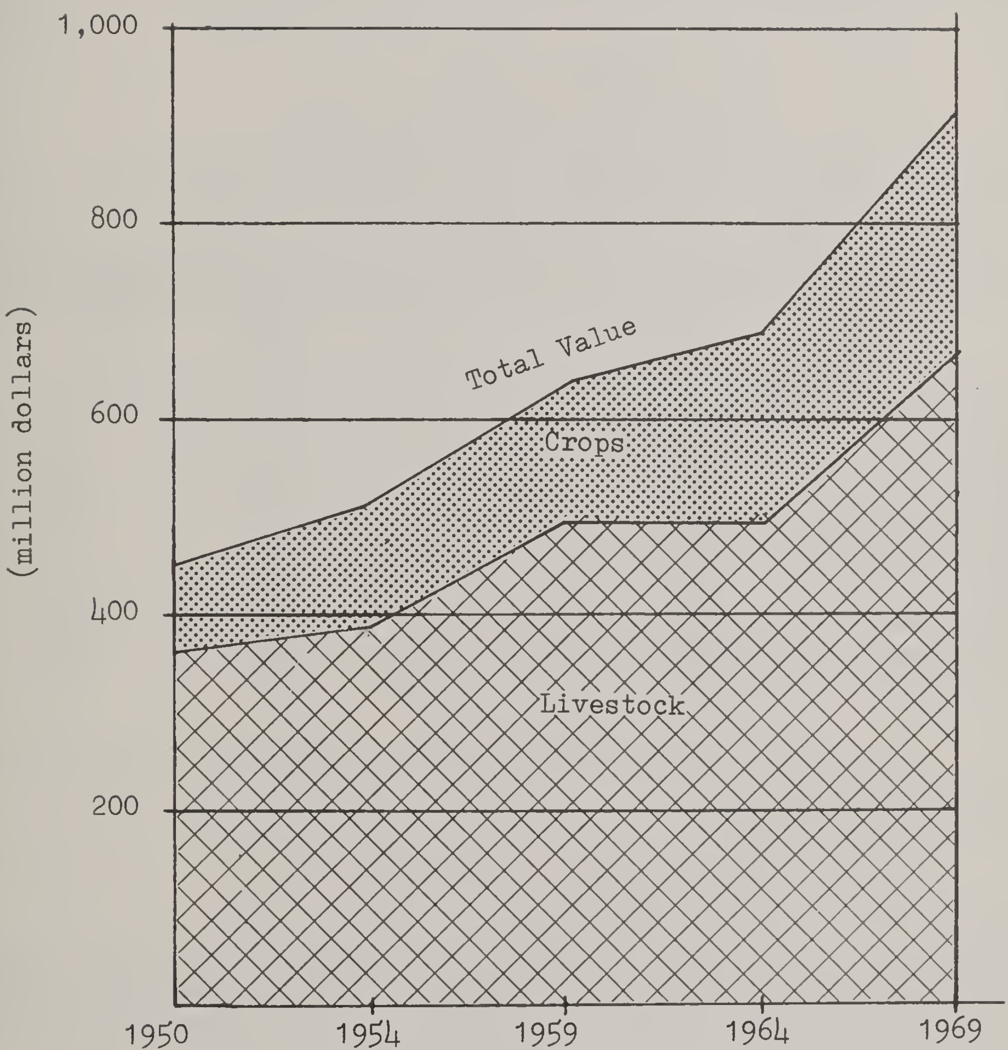
Pesticide use has become increasingly important. Prior to 1964, chemical use data are not available for the economic area. However, the acreage applied with pesticide increased 166 percent from 1964 to 1969. This trend is expected to continue.

4. Current Normal and Projected Yields

The years 1967-1969 were chosen as the base period for the 1980, 2000 and 2020 projections. Land use and production data were collected from the Statistical Reporting Service reports and averaged. This average also is referred to as the current normal.[1/] These data are used to relate projected yields and the cropping patterns from the Conservation Needs Inventory to published data. The major land use and production for the current normal period are shown in Appendix Table B-14.

1/ Current normal represents cropland and pasture land acreage and production in an average year using current production technology. In this report, current normal is based upon a 3-year period (1967-69). The normalization process removes abnormalities caused by weather, other hazards, and farm programs which make a single year unreliable for a land use and production base.

VALUE OF AGRICULTURAL PRODUCTION.
ECONOMIC AREA.
IOWA-CEDAR RIVERS BASIN



Source: Agricultural Census 1950, 1954, 1959, 1964, 1969

Figure III-14.

Crop yields have increased in the past and are expected to continue to increase in the future as new technology and better management techniques are developed and adopted. The current normal yields and projected rates of increase are shown in Table III-3. These projections are consistent with the methodology published in the Upper Mississippi and the Missouri Rivers Comprehensive Basin Reports and related studies. A summary of the actual and projected yields for each SRG (Soil Resource Group)[1] is given in Appendix Table B-15.

TABLE III-3

INDICES OF PROJECTED YIELDS

Iowa-Cedar Rivers Basin

Item	Current Normal Yield	Index of Projected Yields* Year 1980	2000	2020
Corn (bu)	98.6	132	157	180
Corn Silage (ton)	15.7	138	164	182
Oats (bu)	56.1	133	161	186
Soybeans (bu)	32.0	125	143	156
Crop Pasture (day)	151.4	131	150	173
Alfalfa Hay (ton)	3.4	131	150	173
Other Hay (ton)	2.0	131	147	173
Improved Pasture (day)	122.6	131	150	173
Pasture (day)	86.2	130	149	173

* Current normal equals 100; yields equal index number divided by 100 times current normal.

5. Future Agricultural Requirements

Projected national requirements for food and fiber were prepared by OBERS.[1] The major forces considered in these projections include: population, per capita income, consumers' tastes, industrial uses, livestock

1/ See Appendix Table B-1 for definitions of SRG's.

2/ OBERS is an acronyn describing a unified effort of OBE (Bureau of Economics Analysis formerly Office of Business Economics) and ERS (Economic Research Service) to estimate a set of projections based on a common set of assumptions and procedures. The 1972 projection estimates (Series C) are made for the near-term (1980), mid-term (2000) and far-term (2020).

feeding efficiencies, imports, and exports. The appraisal of future conditions relies heavily on historical trends and relationships. The final projections conform with revised national requirements contained in the 1972 OBERS Projections, Series C Projected National Population.

The Basin's share of projected national production requirements for food grains, feed grains, and livestock was determined by a national interregional analysis of historical shares and trends. Commodity flows among regions are accounted for by the historical relationships of production among regions.

a. Livestock

Livestock product projections for the Upper Mississippi River Study (revised and projected share of the Iowa-Cedar Rivers Basin) were used as a basis for this study. These projections were then adjusted to be consistent with published data covering the first ten years of the Upper Mississippi projections. The final projections for the Basin are shown in Table III-4.

Livestock projections are a partial determinant of field crop projections projections, particularly roughages. Hence, it is necessary to project feed conversion rates and ration composition to determine feed requirements. The projections used are based on work done by Iowa State University scientists.[1/] Where serious differences existed between these projections and assumptions in the national projections, adjustments were made to maintain consistency with national projections. Projections of feed unit per pound live weight are shown in Appendix Table B-16. Total feed unit requirements and ration components using these data and livestock projections from Table III-4 are shown in Appendix Table B-17.

b. Roughage Requirements

These requirements assume the acreage of permanent pasture remains unchanged and that the percentage of forest land that is grazed will be lowered to 40 percent by 1980, 30 percent by 2000, and 15 percent by 2020. The share of roughages contributed from permanent grazing land was deducted from total needs to determine the residual requirement of roughage needed from cropland (Appendix Table B-18). The final forage projections shown in Table III-5 were established by taking a mid-point between the minimum requirement of residual and the maximum quantity roughage available from cropland. Roughage is not a constraining factor in meeting alternative futures.

c. Crops

Crop projections also were based on the Upper Mississippi Study. The adjustment to the first ten years of the projections was minor for

1/ "Projections of Livestock Feeding Efficiency 1980-2000-2020, Missouri River Basin States," Great Plains Agricultural Council Publication No. 31, 1968.

TABLE III-4
PROJECTED DEMANDS FOR LIVESTOCK PRODUCTS
Iowa-Cedar Rivers Basin

Item	Unit	1959-61	1980	2000	2020
Beef	Mil. Lbs.	616	800	900	1,050
Pork	Mil. Lbs.	1,223	1,600	1,960	2,360
Lamb & Mutton	Mil. Lbs.	24	17	22	26
Turkeys	Mil. Lbs.	43	85	110	145
Broilers	Mil. Lbs.	4	4	5	7
Farm Chickens	Mil. Lbs.	27	25	30	35
Milk	Mil. Lbs.	1,565	1,850	2,629	3,394
Eggs	Mil. Eggs	1,491	1,336	1,618	1,928

TABLE III-5
PROJECTIONS OF CROPLAND ROUGHAGE REQUIREMENTS
Iowa-Cedar Rivers Basin

Crop	Unit	1967-69	1980	2000	2020
			(000)		
Alfalfa Hay	Ton	1,843	2,180	2,470	2,710
Other Hay	Ton	58	70	80	85
Corn Silage	Ton	1,300	1,530	1,740	1,910
Cropland Pasture	AUD*	68,595	80,940	91,920	100,800

*AUD = Animal Unit Day

corn, but significant increases were required for oats and soybean production. The final projections are shown in Table III-6.

A comparison of yield and requirement indexes for corn and soybeans indicates a change in land use patterns. Corn yields increased at a faster rate than requirements through 2000 which will release some corn acreage. However, by 2020 corn requirements are expected to outdistance yields which will require an increase in corn acreage. Soybean yields are not expected to keep pace with requirement increases which will require more acreage in the future.

TABLE III-6
PROJECTIONS OF FIELD CROPS
Iowa-Cedar Rivers Basin

Item	1967-69	1980	2000	2020
		(million bushels)		
Corn	266	320	400	500
Oats	30	25	20	10
Soybeans	44	60	75	100
Index				
Corn Requirements	100	120	150	188
Corn Yield	100	132	157	180
Soybean Requirement	100	136	170	227
Soybean Yield	100	125	143	157

6. Analysis of Agricultural Sector

The objective of the analysis is to determine both the optimal and realistic combination of crops and land resources to most efficiently meet specified levels of output, subject to specified institutional and environmental constraints.

A generalized model was developed to perform several analytical functions included in the objective above, namely: (1) an evaluation of the projected capability of the resources to meet production requirements, (2) a disaggregation of regional agricultural activity to basins, and (3) the formation of a production inventory system for further analysis of alternative development strategies. The mathematical process, LP (linear programming), employed is a form of enterprise budgeting. The model employed four major inputs to compute a minimum cost combination of cropping patterns and soils which would most efficiently produce the projected demands specified. It optimizes the capability of the resources if they fall short of the projected goals.

The four major input components of the model are: (1) a land inventory identifying broad soil groups by subbasin; (2) land use options, current cropping patterns, fertilizer inputs, cultural practices, and relative on-farm costs of production for each soil group in the inventory; (3) projected output response of crops associated with various inputs by soil groups for each target year; and (4) a system of constraints or bounds to simulate realistic rates of adjustments from current cropping patterns to more efficient combinations, rotation requirements, soil loss limits, and institutional restraints in the target year.

The 12 major land use subconstraints used in the model are as follows: Corn, corn silage, oats, soybeans, cropland pasture, alfalfa

hay, other hay, idle land, improved pasture, pasture land, forest, and other. Each of the 12 land uses were bounded by an upper and a lower limit. These limits are defined as percentage of current normal land use. Since the model used here does not include any agronomical constraints, crop rotation, etc., these bounds serve as a mechanism which restricts the solution to what is assumed to be reasonable deviations from the current normal production plan.

Land use constraints are defined separately for each SRG. The land use constraint is divided into three groups: cropland, pasture land, and other which includes forest land, etc.

Bound percentages for 1980, 2000, and 2020 are shown in Table III-7. The lower bound establishes a minimum acreage level for each crop by SRG. Similarly, the upper bound established a maximum limit which the acreage cannot exceed. Corn bounds, for example, indicate that in 1980 and 2000 the acreage of corn, for each SRG, can vary between 70 and 120 percent of the average acreage in 1967-1969. Since the demand for corn increases between 2000 and 2020, both upper and lower bounds were increased from 2000 levels. In the case of oats, the lower demand over time required that the lower bound be reduced more than the other bounds.

TABLE III-7
SOIL RESOURCE GROUPS BOUNDS BY CROP*
Iowa Cedar Rivers Basin

	1980 & 2000		2020	
	Lower	Upper	Lower	Upper
	-percent-			
Corn	70	120	80	150
Oats	30	65	18	100
Silage	70	100	100	180
Soybeans	90	140	75	125
Alfalfa Hay	90	90	100	100
Other Hay	90	90	100	100
Cropland Pasture	100	100	100	100
Idle Land	50	-	50	-
Pasture	100	100	100	100
Forest	100	100	100	100

*Percentage of current normal.

Given these determinants as previously discussed, the baseline acreages for 1980-2020 were computed and are shown in Table III-8. The productive capacity of the Basin is adequate to meet the projected demand in each of the future years studied under the assumptions used. The percentage of idle land represented in each of the years studied is shown in Figure III-15.

TABLE III-8
BASELINE ACREAGE CHANGES OVER TIME
Iowa-Cedar Rivers Basin

Use	1967-69	1980	2000	2020
		(000)		
Corn	2,700	2,630	2,490	2,535
Silage	83	78	67	69
Oats	528	425	220	96
Soybeans	1,371	1,448	1,603	1,855
Alfalfa Hay	541	523	488	488
Other Hay	29	29	29	29
Crop Pasture	453	408	405	385
Improved Pasture	270	270	270	312
Pasture	399	402	402	399
Idle	859	979	1,218	1,048

*Figures have not been adjusted to account for rounding error.

The estimates of the future productive capacity of the Basin are heavily dependent on yield estimates, which are difficult to predict thirty and fifty years ahead. Therefore, the amount of land needed to meet future production needs would depend on the relationship of future yields and demands.

The main land use changes, percentagewise, occurred for soybeans, oats, and idle land. Generally, land shifted from oats and corn to idle land and soybeans. Corn acreage decreased because projected yields increased faster than projected demand. The trends for these crops can be observed in Figure III-16.

Since the deviations from the current normal land use are restricted by SRG bounds, the SRG's were examined to see which ones were at either bound. The production of corn, soybeans, silage, and oats on the more productive SRG s 1, 2, 3, 10, 14, 18, 20, and 22 was at the upper bound. The model would have used more of these acreages if permitted to do so. Conversely, the production of all other SRG's was at the lower bound,

IDLE LAND AS A PERCENTAGE OF TOTAL CROPLAND
IOWA-CEDAR RIVERS BASIN

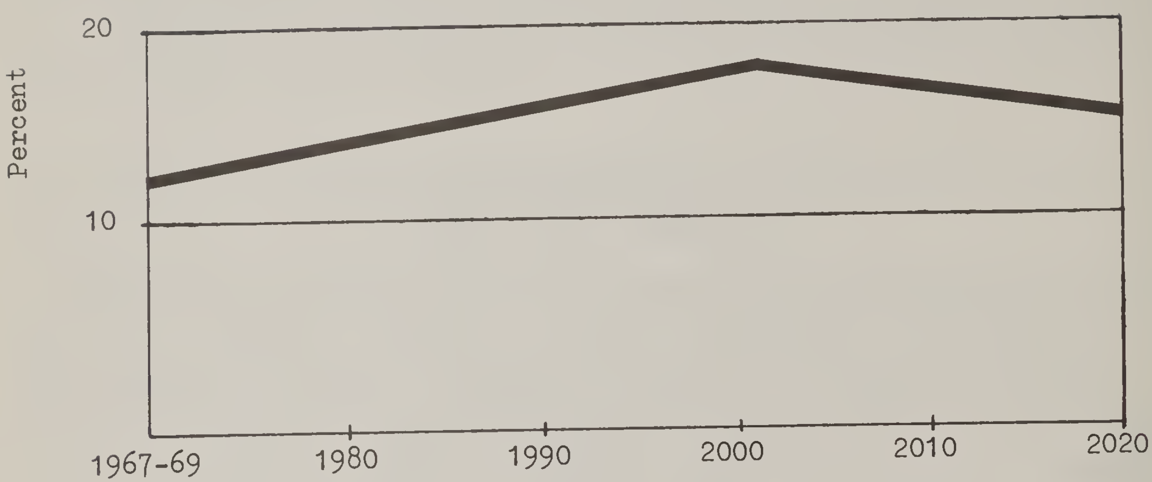


Figure III-15

and the model would have used less of these if permitted to do so. If the restraints were relaxed or removed, production of row crops would be concentrated on the more productive SRG's. The lower bound on idle land was only operative on SRG's 1, 2, 10, and 20. The model would have allotted less acreage of these SRG's to idle land if permitted to do so. All other SRG's were not affected by this constraint.

a. Land Use Changes Through Time

The distribution of crops by SRG is determined by the relative efficiencies, while the distribution of crops by subbasins is determined by the mix of SRG's occurring within a particular subbasin.

The application of the findings presented earlier is not always clear. A farmer utilizes the SRG's available to him which tempers the potential adjustment in land use. The most optimal land use is further modified by the location and accessibility and size of individual SRG's to each other and to the farm as a unit. Farmability, efficiency, and even short-run expediency press operators to nonoptimal land use decisions. The LP model makes adjustments on pennies and farmers do not. This does not negate the comparative advantage that one SRG has over another. Knowing that full adjustment to optimality will not likely occur, comparative advantage will influence trends in that direction. The result will be a tendency to concentrate intensive crop production on SRG's 1, 2, 10, 20, 3, 14, 18, and 22 with greater emphasis on the first four SRG's.

BASELINE ACREAGE CHANGES OVER TIME
IOWA-CEDAR RIVERS BASIN

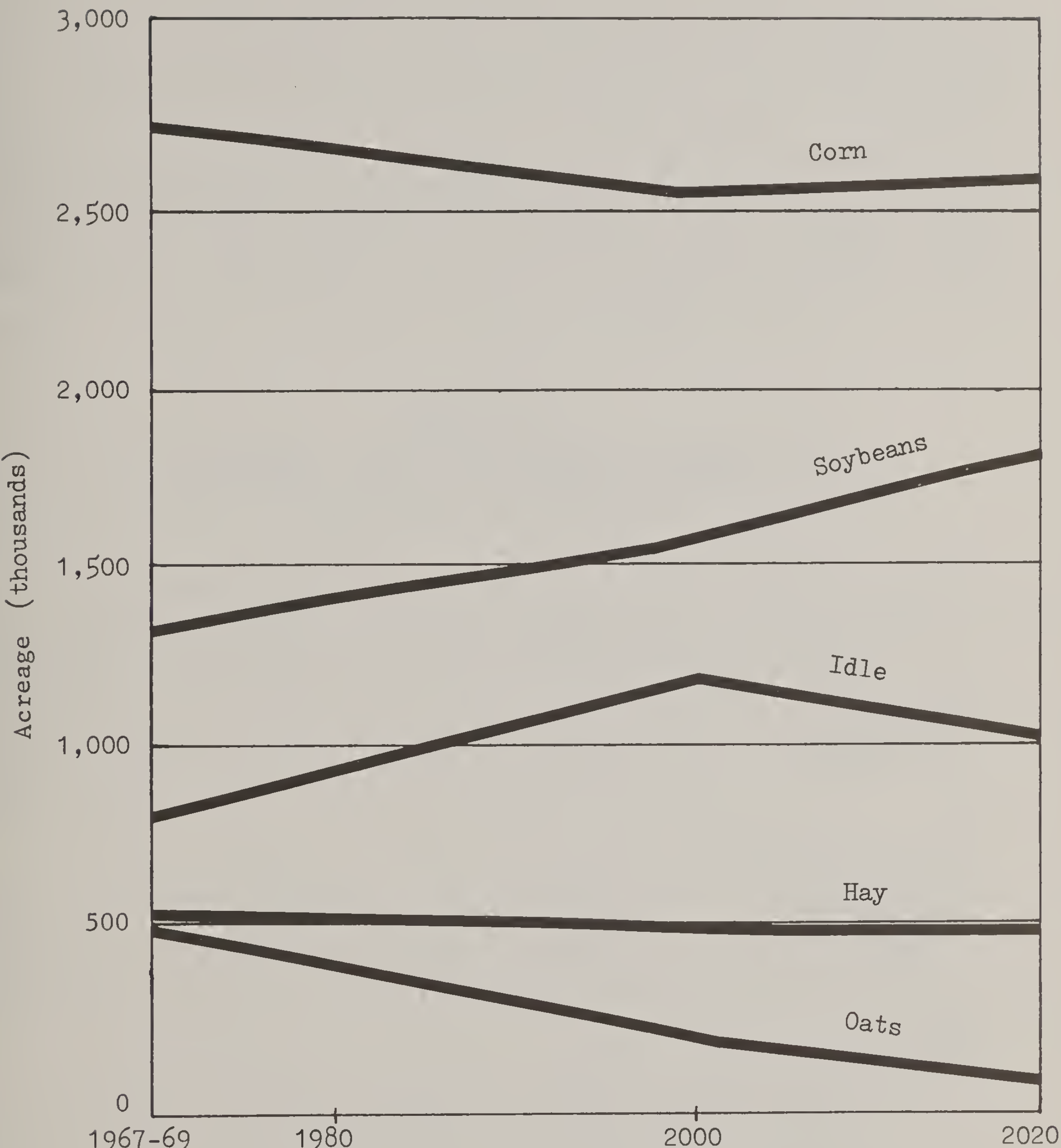


Figure III-16

b. Land Distribution by Subbasin in Year 2000

The soils in the study area were grouped by four major land uses: cropland, pastureland, forest land, and other. The acreage distribution of the major land uses by subbasin is shown in Appendix Table B-19. Percentage distribution of these acreages is 79 percent cropland, 8 percent pasture land, 4 percent forest land, and 3 percent other.

The major land use in each subbasin follows the same general pattern as the Basin (Table III-9). The Minnesota portion of the Cedar Subbasin has the largest percentage of cropland with 89 percent, but all the subbasins, except Flint, have 80 percent or more of the land in crops. The Flint Subbasin has the highest percentage of pasture and forest with 11 percent each.

TABLE III-9
MAJOR LAND USE ACRES, PERCENTAGE DISTRIBUTION BY
SUBBASIN BETWEEN LAND USES, YEAR 2000
Iowa-Cedar Rivers Basin

Subbasin	Cropland	Pasture	Forest	Other
Iowa				
North Half	88	7	2	3
South Half	80	11	6	3
Cedar				
Minnesota Portion	89	6	1	4
Iowa Portion				
North	85	8	4	3
South	84	8	5	3
Shell Rock				
Minnesota Portion	85	7	1	7
Iowa Portion	87	8	1	4
West Fork Cedar	87	9	2	2
Flint	72	13	12	3

The distribution of all corn and soybean acreage through time and by subbasin is shown in Figure III-17. The reader is cautioned that the comparative advantage of the subbasins in this study is dependent upon the distribution and relative productivity of SRG's. Acreage shifts generally were from north to south, and in particular, from Minnesota to northern Iowa portions of subbasins (Appendix Table B-20). Actual shifts between or within subbasins involved additional production which was added to only certain subbasins, i.e., those with the most efficient SRG's available. As demand increased, these SRG's absorbed production first. Those subbasins with the highest percentage increases were northern Iowa portion of Cedar Subbasin, southern half of Iowa Subbasin, Iowa portion of Shell Rock Subbasin, and the southern portion of the Cedar Subbasin.

E. FOREST RESOURCES AND RELATED ECONOMIC ACTIVITY

1. Extent and Nature of the Resource

There are no large concentrations of forest land. Forests are found along streams, in isolated woodlots on steep terrain, and in shelterbelts or windbreaks. The Flint River Subbasin has a few larger contiguous tracts.

Forest land comprises about 4 percent of the Basin, or approximately 310 thousand acres (Table III-10). The Flint Subbasin has 11 percent forest land, compared to 1 percent in the Shell Rock Subbasin. Of the total forest land, 96 percent occurs in Iowa and 4 percent in Minnesota. Historically the Basin has experienced a reduction of forest land. Intensive land use has been the major factor in the conversion of forest land to other uses such as cropland, urban, transportation, utilities, and water projects.

Less than 1 percent, 2,974 acres, of the Basin's forest land is considered noncommercial. Land reserved for county, regional, and State parks, plus land incapable of yielding commercial timber crops are included as "noncommercial". Most of the noncommercial forest land is located inside State and county parks where recreation is the primary use.

Nearly 75 percent of the forest land occurs on the uplands. Two major forest types, oak-hickory and elm-ash-cottonwood, occur on 87 percent of the forested areas in the Basin. In general, the oak-hickory type occurs on the uplands, and the elm-ash-cottonwood type occurs along streams and lower slopes. Numerous other hardwood species are found in these two major types. Eastern red cedar is the only native conifer and occurs as an occasional tree in association with upland hardwood species. Several species of pine have been established for Christmas trees, shelter belts, windbreaks,

CORN AND SOYBEAN ACREAGE THROUGH TIME BY SUBBASIN
IOWA-CEDAR RIVERS BASIN

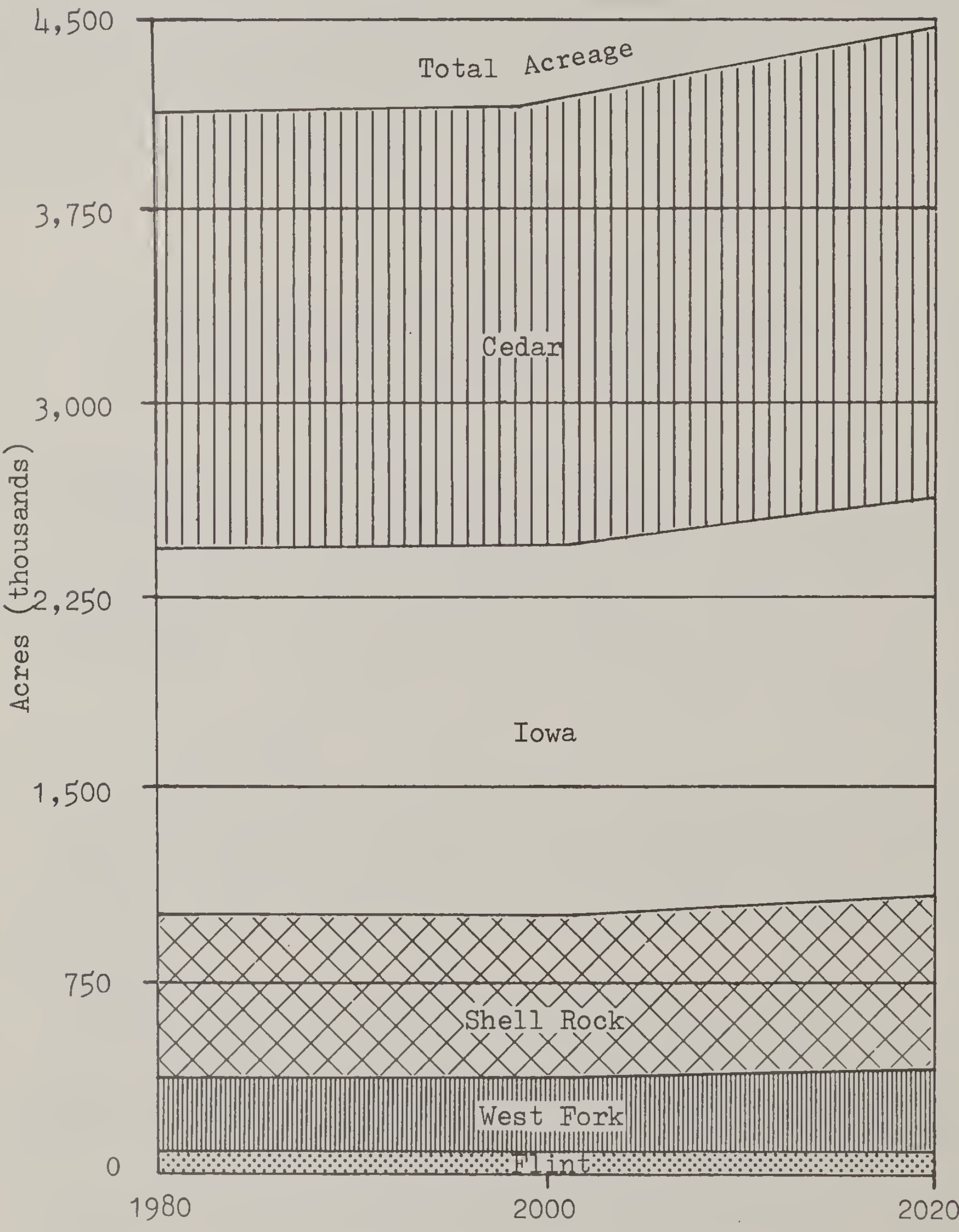


Figure III-17

TABLE III-10

FOREST LAND BY SUBBASIN, STATE, AND BASIN - 1970

Iowa-Cedar Rivers Basin

	Subbasins									Total Basin		
	Iowa	Cedar			W. Fork Cedar	Shell Rock			Flint			
	Total	Iowa Portion	Minn. Portion	Total	Total	Iowa Portion	Minn. Portion	Total	Total	Iowa	Minnesota	Total
	(acres)											
Commercial Forest	140,345	110,280	9,539	119,819	7,906	10,726	3,631	14,357	22,550	293,696	13,170	306,866
Noncommercial Forest	825	1,642	1,059	2,701	84	102	951	1,053	200	964	2,010	2,974
TOTAL FOREST	141,170	111,922	10,598	122,520	7,990	10,828	4,582	15,410	22,750	294,660	15,180	309,840
Total Land	3,083,520	3,315,200			547,840	1,141,120			213,760	7,637,325	664,115	8,301,440
Forest Land % of Total	5	4			2	1			11	4	2	4

Source: Conservation Needs Inventory.
"Forest Resources of Iowa", United States Forest Service, Central States Forest Experiment Station, March 1959.
Estimates from North Central Forest Experiment Station.

and watershed protection. From a wood production standpoint, the elm-ash-cottonwood type is the most important in terms of area, volume of sawtimber, cubic volume, growth potential, and value.

Nearly 97 percent of the Basin's forest land is privately owned on individual farms. The remainder is a combination of Federal, State, county , and municipal lands. The following tabulation indicates the percentage of commercial forest land by various size classes and physiographic sites.

	Sawtimber	Poletimber	Seedlings & Saplings	Non-stocked*	Total
	- - - - - - - - - - - -	- - - -	percent	- - - - - - - -	- - - - -
Upland	26	26	8	14	74
Bottomland	13	6	3	4	26
	39	32	11	18	100

*Nonstocked is defined as 0-10 percent tree cover.

2. Multiple Use of the Resource

Forest land comprises a small portion of the total land area. It is scattered throughout the basin and competition for its use becomes quite intensive for wood production, wildlife, recreation, residential development and aesthetics. Acre for acre, the Basins' forest land is considerably more valuable than large, contiguous forest areas because of its limited extent.

Wood production is a secondary use in comparison to recreation, wildlife, grazing, and watershed protection. However, it is important to individual landowners and those wood using industries who depend upon the resource. Forests occurring along streams are valuable because they provide both developed and dispersed recreation activities. From the wildlife standpoint, they provide the essential habitat link for numerous species to exist within the Basin. Upland forests also provide recreational activities and essential wildlife habitat, but they are somewhat more limited in potential use than forests within stream corridors. Almost sixty percent of the forest land is grazed (Table III-11). The Iowa River Subbasin has the least grazing and the West Fork Cedar River the most.

TABLE III-11
GRAZED FOREST LAND BY SUBBASIN
Iowa-Cedar Rivers Basin

	Subbasin							Total Basin		
	Iowa	Cedar		W. Fork Cedar	Shell Rock		Flint			
	Total	Iowa	Minn.	Total	Iowa	Minn.	Total	Iowa	Minn.	Total
	- - - (thousand acres) - - -									
Grazed Forest	74	71	5	7	8	1	13	172	6	178
Total Forest	141	112	11	8	11	5	23	295	15	310
Percent Grazed	52	63	46	88	73	20	57	58	42	58

Source: Conservation Needs Inventory.

3. Utilization, Kind, Volume, and Value of Wood Products.

A small but viable wood products industry has built up over the past several years. Table III-12 indicates the present production of wood products and the total related value to the landowner. Growth rates averaged 37 cubic feet per acre in 1970. This is a relatively low growth rate because of large amounts of poorly stocked and nonstocked forest land.

Present inventories can support increased cutting for most species in most areas. The growth-cut relationship is not the same for all species and sizes of timber since most of the growth is in smaller trees, whereas most of the cut is from larger timber.

The volume of small timber that can be used for pulpwood, firewood, and other similar products is increasing, where size and quality are not important considerations. The volume of large and high quality timber of preferred species is being overcut. Table III-13 indicates net annual timber growth, cut, and inventory by present and projected periods in millions of cubic feet. Growth exceeds cut by a considerable margin.

4. Employment and Income

About 1,900 persons are employed in the lumber and wood products, and pulp, paper, and allied products industries. Table III-14 indicates present and projected employment in the primary wood-using industries. The number of employees in lumber and wood-using industries is expected to increase 65 percent by year 2020. Employees producing pulp and paper products are projected to double during the same period. The total increase in employment for all primary wood-using industries to year 2020 will be about 85 percent.

TABLE III-12

WOOD PRODUCTION BY SUBBASIN, STATE, AND BASIN - 1970

Iowa-Cedar Rivers Basin

Product	Subbasins									Total Basin		
	Iowa	Cedar			W. Fork Cedar	Shell Rock			Flint			
	Total	Iowa Portion	Minn. Portion	Total	Total	Iowa Portion	Minn. Portion	Total	Total	Iowa	Minnesota	Total
Sawlogs & Veneer Logs (Mbf)	170	200	10	210	3	10	5	15	50	440	15	455
Pulpwood (Cords)	8,700	370	-	370	-	-	-	-	2,500	11,565	-	11,565
Fence Posts (Number)	10,860	7,520	160	7,680	190	1,160	170	1,330	1,510	21,230	330	21,560
Firewood & Fuelwood (Cords)	3,630	1,960	30	1,990	180	10	50	360	190	6,260	80	6,340
Christmas Trees (Number)	190	1,010	40	1,050	210	120	30	150	-	1,530	70	1,600
Total Stumpage Value ($$$$)	77,300	39,000	2,200	41,200	2,000	3,600	2,200	5,800	13,500	135,400	4,400	139,800

Source: Estimates from unpublished papers from Iowa Conservation Commission and North Central Forest Experiment Station.

TABLE III-13
NET ANNUAL TIMBER GROWTH, CUT, AND INVENTORY
PRESENT AND PROJECTED
Iowa-Cedar Rivers Basin

Year	Annual Growth	Annual Cut	Inventory
	(millions of cubic feet)		
1970	15.0	3.4	419
1980	22.0	4.0	557
2000	28.0	7.0	903
2020	29.0	12.0	1,229

Source: Appendix N, Agriculture, Upper Mississippi River Comprehensive Basin Study.

TABLE III-14
PRESENT AND PROJECTED EMPLOYMENT IN THE
PRIMARY WOOD-USING INDUSTRIES
Iowa-Cedar Rivers Basin

Industry	Year			
	1970*	1980**	2000**	2020**
	(number of employees)			
Lunber & Wood Products	873	931	1,154	1,449
Pulp, Paper, & Allied Products	1,048	1,294	1,726	2,096
Total	1,921	2,225	2,880	3,545

Source: *Iowa Manufacturers, Iowa Development Commission.

**Appendix P, Agriculture, Upper Mississippi River Comprehensive Basin Study.

LOGGING ACTIVITY IN THE BASIN

Projected income in the primary wood using industries is shown in Table III-15. Total income is expected to increase more than seven-fold by year 2020.

TABLE III-15
PRESENT AND PROJECTED INCOME IN THE
PRIMARY WOOD-USING INDUSTRIES
Iowa-Cedar Rivers Basin

Industry	Year 1970*	1980**	2000**	2020**
	(millions of dollars)			
Lumber & Wood Products	4.5	7.0	12.8	23.8
Pulp, Paper, & Allied Products	9.2	17.7	38.6	76.7
Total	13.7	24.7	51.4	100.5

Source: *Iowa Manufacturers, Iowa Development Commission and Appendix N, Agriculture, Upper Mississippi River Comprehensive Basin Study.

**Appendix N, Agriculture, Upper Mississippi River Comprehensive Basin Study.

5. Capital Investment

Capital investment in the forest products industry amounted to approximately 2.0 million dollars in 1970. In the pulp and paper industry, the increase in investment is attributed to the continuing efforts of mills to conserve fiber and water, meet requirements for greater pollution control imposed through regulatory activities, and new mill construction. It is expected that existing mills will spend increasing portions of their capital budgets for waste treatment facilities in some form.

F. OUTDOOR RECREATION

Recreation demand is an increasingly important factor to be considered in the use of land and water resources. The streams, lakes, and rolling wooded topography of the Basin's corridors are suitable for several types of recreational facilities. An inventory of existing facilities was completed and is shown in Appendix D-1. A summary of the acreage of land and water involved in these sites is shown in Table III-16.[1/]

Due to the seasonal nature and weekend use of recreational facilities, it is necessary to estimate periods of peak outdoor recreation demands. The number of peak demand days and percentage of total recreation occurring on peak days is reported in Outdoor Recreation in Iowa Reports. Utilizing the percentage use on peak days and the number of peak days, peak demand for outdoor recreation occasions is estimated in Table III-17 for 1970 and 3 projected time periods. Utilizing the design criteria and turnover rates from the Outdoor Recreation In Iowa Reports, resource requirements are determined for the 3 future time periods (Table III-18).

1/ The data were not available for separate land and water acreages. Neither were the data available to distinguish between the recreation facilities provided at each site. Therefore, a comparison can be made at this time only on a total acreage basis.

TABLE III-16
ACREAGE OF RECREATIONAL SITES
Iowa-Cedar Rivers Basin

County	Acreage	County	Acreage
Benton	1,944	Keokuk	1
Black Hawk	3,725	Linn	2,574
Bremer	197	Louisa	663
Buchanan	38	Marshall	637
Butler	3,409	Mitchell	256
Cedar	522	Mower, MN	588
Cerro Gordo	5,720	Muscatine	2,764
Chickasaw	17	Poweshiek	427
Des Moines	678	Tama	4,098
Floyd	499	Washington	119
Franklin	755	Winnebago	1,826
Freeborn, MN	5,571	Worth	3,958
Grundy	189	Wright	924
Hancock	2,900		
Hardin	2,086	Grand Total	65,573
Iowa	844	Iowa Portion	59,414
Johnson	17,644	Minnesota Portion	6,159

Source: Outdoor Recreation in Iowa
Minnesota Outdoor Recreation Plan and Community Profiles

TABLE III-17
PEAK OUTDOOR RECREATION DAY DEMAND
Iowa-Cedar Rivers Basin

	Peak Demand			
Activity	1970	1980	2000	2020
Picnicking	123,461	326,631	521,651	763,777
Fishing	71,530	94,099	156,544	232,842
Pool Swimming	40,769	48,013	76,477	116,121
Golfing	15,717	21,070	43,096	67,306
Boating	33,584	34,962	76,980	133,582
Camping	20,130	27,029	59,514	103,274
Natural Environment Swimming	29,522	41,373	76,477	149,298
Nature Walks	20,377	28,744	65,206	127,296
Water Skiing	3,163	4,597	14,339	37,324

Source: Outdoor Recreation in Iowa
Minnesota Outdoor Recreation Plan and Community Profiles

TABLE III-18
REQUIRED RESOURCES FOR PEAK OUTDOOR RECREATION
Iowa-Cedar Rivers Basin

Activity	Required Resources in Acres			
	1970	1980	2000	2020
Picnicking				
Developed	482	1,276	2,038	2,984
Supported	9,640	25,520	40,760	59,680
Fishing	38,149	50,186	83,490	124,182
Pool Swimming	9	11	18	27
Golfing				
Developed	3,929	5,268	10,774	16,827
Supported	982	1,317	2,694	4,207
Boating	19,031	19,812	43,622	75,696
Camping	839	1,126	2,480	4,303
Natural Environment Swimming	27	38	70	137
Nature Walks				
Developed	815	1,150	2,608	5,092
Supported	20,375	28,750	65,200	127,300
Water Skiing	6,958	10,113	31,546	82,113
Total	101,236	144,567	285,300	502,548

Source: Outdoor Recreation in Iowa
Minnesota Outdoor Recreation Plan and Community Profiles

CAMPGROUND AT LAKE MACBRIDE STATE PARK

G. RELATIONSHIP OF ECONOMIC DEVELOPMENT AND WATER AND LAND RESOURCE DEVELOPMENT

Resource development causes certain general effects upon economic activity, both inside and outside the Basin. The degree of national or regional effect lessens as the distance from the Basin increases. Water is a basic necessity to economic activity. Little economic activity takes place without it or with too much of it.

Development of water resources influences the development of related land resources and other economic activities. Initial investments by public or private sources typically stimulate additional investments, either to utilize the initial developments or to compete with them. Frequently, the need for water resource development is a direct result of economic development that has created a problem or need that requires correction or action before further development can occur.

CHAPTER 4

WATER AND RELATED LAND RESOURCE PROBLEMS AND NEEDS

The Basin has a large natural resource of productive soils. The total water supply is plentiful, but sometimes scarce in terms of availability and quality. Water and land resource problems have stemmed from man's demands on the resources to provide the basic elements of his existence. His lack of understanding regarding the capabilities of the resources and the consequence of his actions have been and remain the basic problem.

Over 93 percent of the land in the Basin is suitable for cultivation, of this, 15 percent has no problem to limit its use. The remaining land has limitations that either restrict its use or requires measures to preserve or develop the resource. These problems include erosion, sediment and floodwater damages, inadequate drainage, and low water holding capacity soils.

A. LAND PROBLEMS AND NEEDS

1. Erosion Problems

There are 3.8 million acres of crop, pasture and forest lands that have a potential water and/or wind erosion problem. Of this, 0.5 million acres are adequately treated leaving 3.3 million acres needing treatment. Runoff water causes sheet, rill, and gully erosion. Wind also causes sheet erosion as well as blowout or dune erosion. Excessive erosion reduces the ability of land to produce crops. It is also the major source of sediment pollution in surface water resources.

The most severe land and water resource problem in the Basin is sheet and rill erosion caused by water runoff. Sheet and rill erosion is the removal of soil from the land surface by the action of wind and/or rainfall and runoff water. Sheet erosion is the removal of a relatively uniform layer of soil. Rill erosion is the formation of shallow channels that can be smoothed out by normal cultivation.

Gully erosion caused by flowing water results in the removal of soil from the land surface with formation of channels that cannot be smoothed out by normal cultivation. While gully erosion is not a major problem in the Basin as a whole, there are small isolated areas with gully erosion problems mainly in LRA's 104 and 108. There are localized erosion problems which have occurred as a result of grazing, poor management, or intensive land use above steeply sloping forest land.

Wind erosion is a serious problem in localized areas, especially LRA 103, but overall is not a major problem. Airborne soil can act as an irritant and health depressant to people and animals, cover highways and railroad tracks, fill ditches and waterways, and cover fences. Monetary values for this type of damage have not been estimated in this study.

Total erosion was estimated using general relationships adapted from the Universal Soil Loss Equation. In the Base period (1967 to 1969) less than five million acres of tilled cropland were eroding 24 million tons for an average of 5 tons per acre each year. This gross erosion rate is not expected to change appreciably by the year 2020 due to the small change in acreages tilled. It should be noted that these rates are averages for all soils and would be higher for the more erosive soils.

2. Floodwater and Sediment Problems

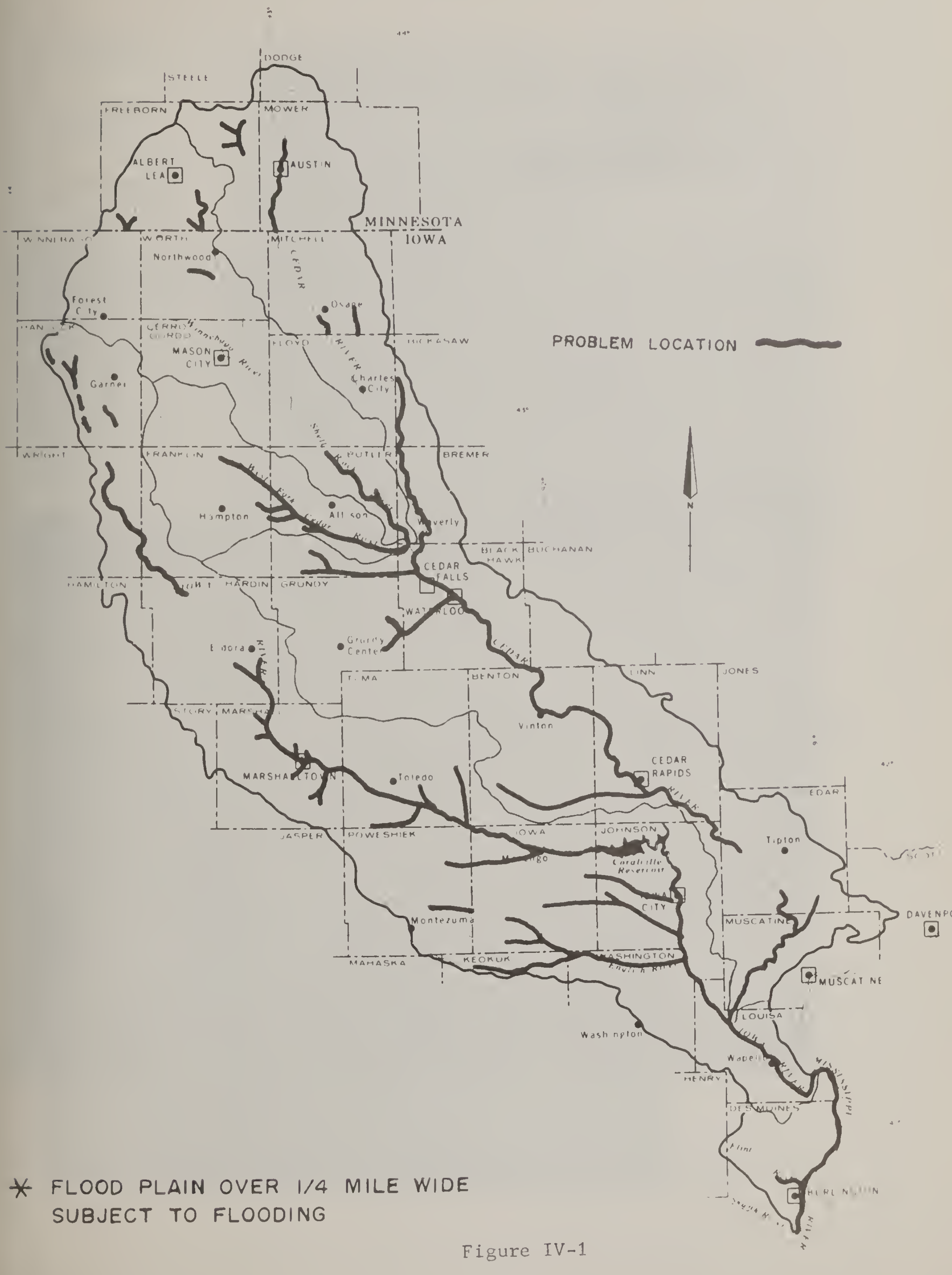
No one flood event has produced record stages Basin-wide. In the upstream portion of the Iowa Subbasin, the record flow was June 1954. The June 1918 flood is the largest on the Iowa River at Marshalltown and downstream to Iowa City. Some of the larger tributaries around Iowa City and the Iowa River downstream of Coralville Lake experienced their record flood in September 1965. The northern part of the Cedar Subbasin and the Shell Rock Subbasin experienced the record snowmelt-rain floods of March 1961 and April 1965. Near the outlet of the Cedar River, the June 1947 event is the record flood. Almost every year produces a new record flood in some portion of the Basin.

Floodwater and sediment damage are a major problem in the Basin. A total of 46 urban areas have been identified as having flood problems (Table IV-1). There are 774,000 acres of crop and pastureland subject to flooding in both the upstream and downstream areas.[1/] The flood plain areas that exceed one-quarter mile in width and have flooding problems are shown in Figure IV-1.

Floodwater damages are divided into various categories. These damages are: crops and pasture, other agricultural, rural non-agricultural, transportation facilities, urban areas, land, and indirect.

1/ "Upstream" is defined as being above the point at which the drainage area equals 250,000 acres; "downstream" is below the point at which the drainage area equals 250,000 acres.

MAJOR FLOODING PROBLEMS
IOWA-CEDAR RIVERS BASIN



✱ FLOOD PLAIN OVER 1/4 MILE WIDE SUBJECT TO FLOODING

Figure IV-1

EROSION AND SEDIMENT . . .

A PROBLEM!

THE LAND RESOURCE IS DAMAGED

LAND

USES

CHANGE

LAKES

ARE

FILLED

TABLE IV-1

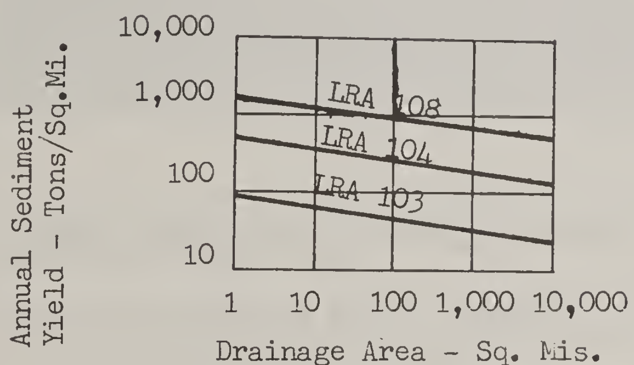
URBAN AREAS WITH FLOODING PROBLEMS
Iowa-Cedar Rivers Basin

Urban Area	Stream Affecting
Hudson, Ia.	Black Hawk Creek
Iowa City, Ia.	Rapid & Ralston Creek
Iowa Falls, Ia.	Iowa River
Janesville, Ia.	Cedar River
LaPorte City, Ia.	Cedar River & Wolf Creek
Letts, Ia.	Indian Creek
Marshalltown, Ia.	Iowa River
Mason City, Ia.	Willow Creek
New Hartford, Ia.	Beaver Creek
Northwood, Ia.	Shell Rock River
Oakville, Ia.	Iowa River
Oxford, Ia.	Clear Creek
Sheffield, Ia.	Bailey Creek
Tama, Ia.	Iowa River
Twin Lakes, Minn.	Goose Creek
Union, Ia.	Local drainage
Vinton, Ia.	Cedar River
Wapello, Ia.	Iowa River
Waterloo, Ia.	Cedar River
Washburn, Ia.	Cedar River
Waverly, Ia.	Cedar River
West Branch, Ia.	Wapsinonoc Creek
West Liberty, Ia.	Wapsinonoc Creek

Urban Area	Stream Affecting
Albert Lea, Minn.	Shell Rock River
Atalissa, Ia.	Cedar River
Austin, MInn.	Cedar River
Belle Plaine, Ia.	Unnamed Creek
Belmond, Ia.	Iowa River
Burlington, Ia.	Mississippi River
Cedar Falls, Ia.	Cedar River & local
Cedar Rapids, Ia.	Cedar River & Verdon
Charles City, Ia.	Cedar River
Chelsea, Ia.	Iowa River
Columbus Jct., Ia.	Iowa River & Short Creek
Coralville, Ia.	Clear Creek & Iowa River
Denver, Ia.	Quarter-Section Run
Dows, Ia.	Iowa River
Dumont, Ia.	W. Fork Cedar River
Evansdale, Iowa	Cedar River
Fertile, Ia.	Winnebago River
Finchford, Ia.	W. Fork Cedar River
Forest City, Ia.	Winnebago River
Fredonia, Ia.	Iowa River
Greene, Ia.	Shell Rock River
Hampton, Ia.	Squaw Creek
Hills, Ia.	Old Man Creek
Hollandale, Minn.	Turtle Creek

There are 596,000 acres of upstream crop and pastureland subject to floodwater and sediment damage. Damages consist of destruction of all or part of the growing crops, replanting costs, increased costs of production, and reduced yields. The total floodwater damage classed as crop nd pasture, other agricultural, and rural non-agricultural is $8.4 million.

Sediment yield data from the Upper Mississippi River Comprehensive Basin Study show that LRA 108 yields 20 times as much sediment as LRA 103 and five times as much as LRA 104 (Figure IV-2).



Source: Appendix G, Fluvial Sediment Upper Mississippi River Comprehensive Basin Study

Figure IV-2

3. Impaired Drainage Problems and Needs

Agriculturally, excess water becomes a problem when it interferes with land preparation, tillage, plant development, and harvesting operations. These problems contribute to reductions in crop yields, increased production costs, and lower quality products.

Agricultural drainage problems may be caused by excess surface or subsurface water or both. Surface drainage problems exist generally where the drainage pattern is undeveloped. Low relief of the Basin is a contributory factor. In many problem areas, surface and subsurface drainage systems are interdependent. These problems are concentrated in Land Resource Area 103 and scattered elsewhere throughout the Basin.

There is a need for agricultural drainage in the Kenyon-Floyd-Clyde-Schley soil association area (soil association 13 - Figure II-4) that lies largely in LRA's 104 and 108. This soil

FLOODWATERS CAUSE MILLIONS OF DOLLARS DAMAGE EACH YEAR TO RURAL AREAS . . .

AS WELL AS TO
URBAN AREAS AND
PUBLIC FACILITIES

association is an area of about one million acres. Drainage of these soils is needed both for increased economic returns and to allow for installation of conservation practices such as terracing and contouring. Without drainage these conservation practices are not recommended on some soils in this association because they slow surface water runoff. Slowing the water allows more to infiltrate which can add to the existing drainage problems.

Some soils are subject to flooding and will need flood protection to realize their full agricultural productive capacity. In some areas, channels are designed for both drainage and flood prevention. Outlets lacking sufficient capacity are a problem closely related to flood prevention. Adequate floodwater channels will ordinarily fulfill the requirements for drain outlets.

Initially 2.4 million acres of crop and pastureland in the Basin had a wetness problem. Currently, 1.2 million acres have been adequately drained. Most of the remaining area can reach its full crop production potential with adequate drainage. There are some areas that are not practical to drain because of either soil conditions or outlet availability.

As a part of this study, an inventory was made of the legal drainage districts that use tile for outlets. Very few such drainage districts are located in the southern half of the Basin; therefore the study was confined to the northern portion (Appendix E-1). The study was made with the use of available county records. No attempt was made to field check the tile mains to determine if they had been installed according to those plans of record or the adequacy of their outlets. The study included 528 legal drainage districts encompassing more than 600,000 acres (Table IV-2). Eighty-two percent of the drainage districts involved are located in Land Resource Area 103, 13 percent in LRA 104, and 5 percent in LRA 108. Most of these "legal drains" were installed in the 20 year period following passage of the first Iowa Drainage Law in 1906, thus many systems are over 50 years old. It is estimated that 60 to 75 percent have inadequate capacity to meet the present needs.

The evaluated impact of drainage on crop production for the year 2000, assuming all drainage needs are satisfied, is $81 million annually. This is based on potential increased yields. Additional benefits not calculated would result from reduced production costs and improved quality.

4. Forest Resource Problems and Needs

a. Land Conversion

Based on past trends it is anticipated that the area of commercial forest land will continue to decrease slightly. Higher prices for

Impaired drainage results in lost work days, increased production costs, reduced crop yields, and lower income for farmers.

•

TABLE IV-2
INVENTORY OF LEGAL DRAINAGE DISTRICTS
Iowa-Cedar Rivers Basin

	SUBBASIN				
	Iowa Upper Portion	Cedar Upper Portion	West Fork	Shell Rock	Total
Acres in Subbasin	879,551	1,064,138	551,879	1,124,174	3,619,742
Number of Drainage Districts	275	30	74	149	528
Acres in Drainage Districts	323,100	32,577	94,334	161,279	611,290
% of Acres in Drainage Districts	36.7	3.1	17.1	14.4	16.9
Less than $\frac{1}{4}$" Coefficient 1/					
Number of D.D.'s	128	11	37	81	257
% of D.D.'s	46.9	36.7	50.0	54.4	48.8
Acres in D.D.'s	210,483	16,034	57,727	107,855	392,099
% of Acres in D.D.'s	65.1	49.2	61.2	66.9	64.1
1/4" to 3/8" Coefficient					
Number of D.D.'s	87	7	18	43	155
% of D.D.'s	31.9	23.3	24.3	28.8	29.5
Acres in D.D.'s	71,387	3,478	22,122	39,837	136,824
% of Acres in D.D.'s	22.1	10.7	23.5	24.7	22.4
3/8" to 1/2" Coefficient					
Number of D.D.'s	32	7	13	14	66
% of D.D.'s	11.0	23.3	17.6	9.4	12.5
Acres in D.D.'s	21,547	8,960	11,058	8,275	49,840
% of Acres in D.D.'s	6.7	27.5	11.7	5.1	8.1
Over $\frac{1}{2}$" Coefficient					
Number of D.D.'s	28	5	6	11	50
% of D.D.'s	10.2	16.7	8.1	7.4	9.5
Acres in D.D.'s	19,683	4,105	3,427	5,312	32,527
% of Acres in D.D.'s	6.1	12.6	3.6	3.3	5.3

1/Refers to capacity of tile mains. Tile mains do not have the capacity to remove one-fourth inch of water from drainage area of the drainage district.

livestock and row crops in recent years have accelerated the conversion of bottom land and lower slope hardwood forests to pasture and cropland.

Urban-industrial areas will continue to expand and environmental damages will be compounded in most cases. Commercial forest land involved will either be cleared or converted to a park atmosphere, which will halt forest regeneration and deteriorate forest composition.

Conversion of forest land will continue because of the increasing need for energy sources and transportation networks. Power line rights-of-way and highways are examples of developments that further reduce the commercial forest land base. The following tabulation indicates the reduction of commercial forest land by year 2020:

1970	1980	2000	2020
	Acres		
309,840	298,000	285,000	265,000

It is desirable to have a balanced pattern of vegetative landscapes from the standpoint of scenic, esthetic, recreation, and fish and wildlife resources. The loss of forest land through land conversion takes away an important part of the environment and will result in an overall degradation of recreation potentials, wildlife habitat, watershed protection and esthetic appeal, especially in the stream corridors.

b. Grazing - Erosion/Sedimentation

An erosion/sedimentation survey of forested areas in the Basin was conducted by the U.S. Forest Service and the Iowa Conservation Commission during the study period. Accelerated erosion of forest lands is caused by a number of factors including grazing, logging, fire, mining, roads, recreation use, housing tract developments, and overland flow from crop and pastureland located above forested areas. It was determined during the survey that light grazing, under most conditions, contributed only minor amounts of sediment to the Basin's streams.

Grazing of forest land continues to be the major forest resource problem. Adverse effects of grazing include deterioration of wildlife habitat by reduction in carrying capacity, damage or destruction of future timber crops, and accelerated erosion with resulting sedimentation.

Table IV-3 indicates the erosion by subbasin expressed in tons per acre per year and total tons per year. The Flint Subbasin had the highest rate of erosion, 6 T./ac/yr. The lowest rates were found in the Shell Rock Subbasin.

TABLE IV-3
FOREST LAND ACCELERATED EROSION 1970
Iowa-Cedar Rivers Basin

Subbasins	Total Grazed Acres	Upland Grazed Acres	Erosion T./ac./yr.	Erosion T./yr.
Iowa	73,806	62,735	2.50	156,838
Cedar	76,801	65,281	4.03	263,570
Iowa	(71,322)	(60,624)	(4.29)	(260,077)
Minn.	(5,479)	(4,657)	(0.75)	(3,493)
W. Fork Cedar	6,762	5,748	1.1	6,323
Shell Rock	8,621	7,328	0.42	3,093
Iowa	(7,670)	(6,520)	(0.40)	(2,608)
Minn.	(951)	(808)	(0.60)	(485)
Flint	12,540	10,659	6.20	66,086
Total	178,530	151,751	—	495,910
Iowa	(172,100)	(146,285)	—	(491,932)
Minn.	(6,430)	(5,466)	—	(3,978)

OVERGRAZING BY LIVESTOCK DAMAGES WOODLANDS

Excessive forest land erosion and sedimentation creates several problems including:

(1) Reduction of the inherent productivity of the land for growing future timber crops;

(2) Reduction of wildlife habitat carrying capacities, which in turn adversely affects wildlife populations;

(3) Reduction of present and potential recreational use by adversely affecting the user's recreational experience including visual pollution.

c. Fire

Wildfire is not a major problem. Present fire protection programs need to be continued during future years.

d. Insects and Disease

Detection and control of possible insect and disease attacks could minimize their impact on the forest resource. For example Dutch Elm disease has caused a considerable loss of American elms in the past decade. No economical means of control has been found that will eliminate the disease.

e. Heavy Recreational Use

Heavy recreational use of certain areas of forest land has deteriorated and will continue to deteriorate forest stands if not regulated. Soil compaction, damage from chopping, lantern burns, and unregulated use of motorized vehicles will hasten deterioration. No inventory of these sites was made.

f. Air and Noise Pollution

With the expected population increases, noise and air pollution have the potential of growing more serious. This problem is concentrated around urban, industrial, and suburban areas. Certain kinds of vegetation, primarily various species of trees, need to be planted in and adjacent to the urban, industrial, and suburban areas for pollution reduction purposes. Additional benefits will include enhancement of these areas from a recreational, wildlife, and scenic basis.

g. Environmental Corridors

The primary purpose of the environmental corridor concept in this report is to inform landowners, land use planners and governing officials that the corridors exist in limited areas, and to describe the problems associated with their preservation and intelligent use. The environmental corridors are the remaining land and water areas that have not been severely altered by man. The diversity of forest land and open space offers recreational values, promotes scenic beauty and protects important ecosystems. There is a need to establish, preserve, enhance or manage approximately 135 miles of high value stream corridors for recreation, wildlife habitat, esthetics, watershed protection and archeological uses (Appendix F).

5. Wildlife (Habitat) Problems and Needs

Habitat problems and needs are similar throughout the Basin; however, the magnitude varies considerably. The northern portion has the most restrictive habitat conditions with the greatest need for more quality grassland and woodland; progressing southward the need decreases.[1/] Problems and needs of wildlife habitat by habitat types are described in this section.

Cropland can provide wildlife habitat through most of the year. Problems associated with cropland are:

a. Fall grazing reducing habitat value on 56 percent,

b. Fall tillage destroying food nd cover on 50 percent,

1/ Data from Soil Conservation Service Wildlife Habitat Inventory, 1973.

c. Large fields of single crop resulting in a similarity of habitat that restrict the population of most wildlife species,

d. Need for adequate winter and escape cover in proximity to cropland.

The grassland habitat type provides cover for a variety of wildlife species and is especially important as nesting cover. Problems of this habitat type are:

a. Heavy grazing by livestock which reduces habitat value,

b. Early season mowing for hay and weed control that destroy nesting habitat and can injure wildlife directly,

c. The high percentage of relatively low habitat value bluegrass used for pasture,

d. The limited amount of grassland habitat available, especially in the northern portion, which restricts populations of species requiring this habitat type.

Woodland habitat is used extensively for winter cover. Problems of this habitat type are:

a. The small amount of this type available,

b. Grazing of woodlots by livestock which destroys undergrowth and reduces habitat value,

c. The poor quality of farmstead windbreaks which reduces their value as winter shelter for wildlife.

The wetland habitat type accounts for a small percentage of the Basin but provides basic needs for several wildlife species. The greatest problem with this type is the small amount available.

There are no known threatened plant or animal species found in the Basin. The Southern Bald Eagle and the Peregrine Falcon do pass through Iowa during periods of migration. Fish and plants that are comparatively rare in the Basin but are fairly common in some other parts of the United States are as follows: Fish - Ozark Minnow, Rock Sturgeon, some Darters; Plants - Skunk Cabbage, Pink Lady Slippers, Yellow Lady Slippers, all Orchids (showy orchids, etc.), Shinleaf, Pipsessewa, Prairie plants, Leatherwood, and Indian cucumber.

6. Production Problems and Needs

a. Agricultural Crops

The productive capacity of the Basin is sufficient to supply the needs of the OBERS projections (Chapter III) in each of the years studied (1980, 2000, 2020). At this time, the Basin is called upon to maximize production at relatively high prices. For this reason an alternative future depicting the high demand - full production case was studied (see Appendix B-3). The erosion problem inherent for this and the base line solutions will be discussed.

The projected erosion problem and soil losses are under the assumption that the OBERS demands will be met with full use of technology, especially fertilizer. If the demands exceed those assumed or if the production inputs do become limited then the erosion-soil loss situation will get much worse. As the less productive soils with a greater erosion problem are brought into row crop production the total erosion will increase greatly as will soil resource depletion.

b. Forest Crops

Timber products harvested in the Basin fall short of present and projected demand. The needs represent the timber products that have and will be imported into the Basin. The projected needs must be met by expanded imports. Table IV-4 compares present and future demand to supply. The supply shown includes an increase in per acre productivity and a decrease in commercial forest land.

TABLE IV-4
PRESENT AND FUTURE DEMAND, SUPPLY AND NEED FOR TIMBER PRODUCTS
Iowa-Cedar Rivers Basin

	Year			
	1970	1980	2000	2020
	Millions of Cubic Feet			
Total Demand*	13.0	20.0	35.0	39.0
In Basin Supply**	3.4	4.0	7.0	12.0
Need***	9.6	16.0	28.0	27.0

*OBERS
**USDA Forest Survey
***1970 need was met by importing from outside the Basin. The projected need must be met by expanded imports.

Forest Land Treatment Needs, Table IV-5, indicates the present needs for reforestation, timber stand improvement, forage improvement, and grazing reduction by subbasin, basin and state. Opportunities to satisfy these individual forest land needs are described in Chapter VI, Opportunities for Development. Forest land treatment, is the first step in satisfying the needs for recreation, wildlife, and esthetics.

The Environmental Corridor report of the Iowa-Cedar Rivers Basin Study describes the intricate relationship of forest land, wildlife habitat, recreation, water quality, watershed protection and esthetics for multiple use.

7. Land Use Planning Problems and Needs

Conflicting interests of adjacent land users have generated some degree of land use planning. Population growth has caused the number of conflicts to increase. From 1900 to 1970 the population of the Basin increased three-fold, while the number of land use conflicts increased many times that amount.

The use of land should follow a logical pattern depending on the limitations of the soils. Houses should not be built in flood-prone areas. Steep, unprotected land should not be plowed and planted to row crops. The long term needs of society should receive more attention than the short term needs of the land user.

In recent years zoning has been used to guide the use of land in both urban and rural areas. Increased urban expansion and rapid conversion of agricultural land to non-agricultural use has created a need for guidance and regulation of land use.

Within the Basin there are 17 zoned counties, 2 adopting zoning, 3 planning to zone and 12 not considering zoning (Figure IV-3). The counties where the population pressure is the greatest have generally adopted zoning as a land use guiding device.

There is a need for additional land resource data so that wise land use decisions can be made. The capability, hazards, and limitations of land for multiple uses needs further development. There is a particular need to define flood hazard areas, especially in or near expanding urban areas where construction in a flood-prone area is a possibility in the near future.

B. WATER PROBLEMS AND NEEDS

1. Surface Water Quality Problems and Needs

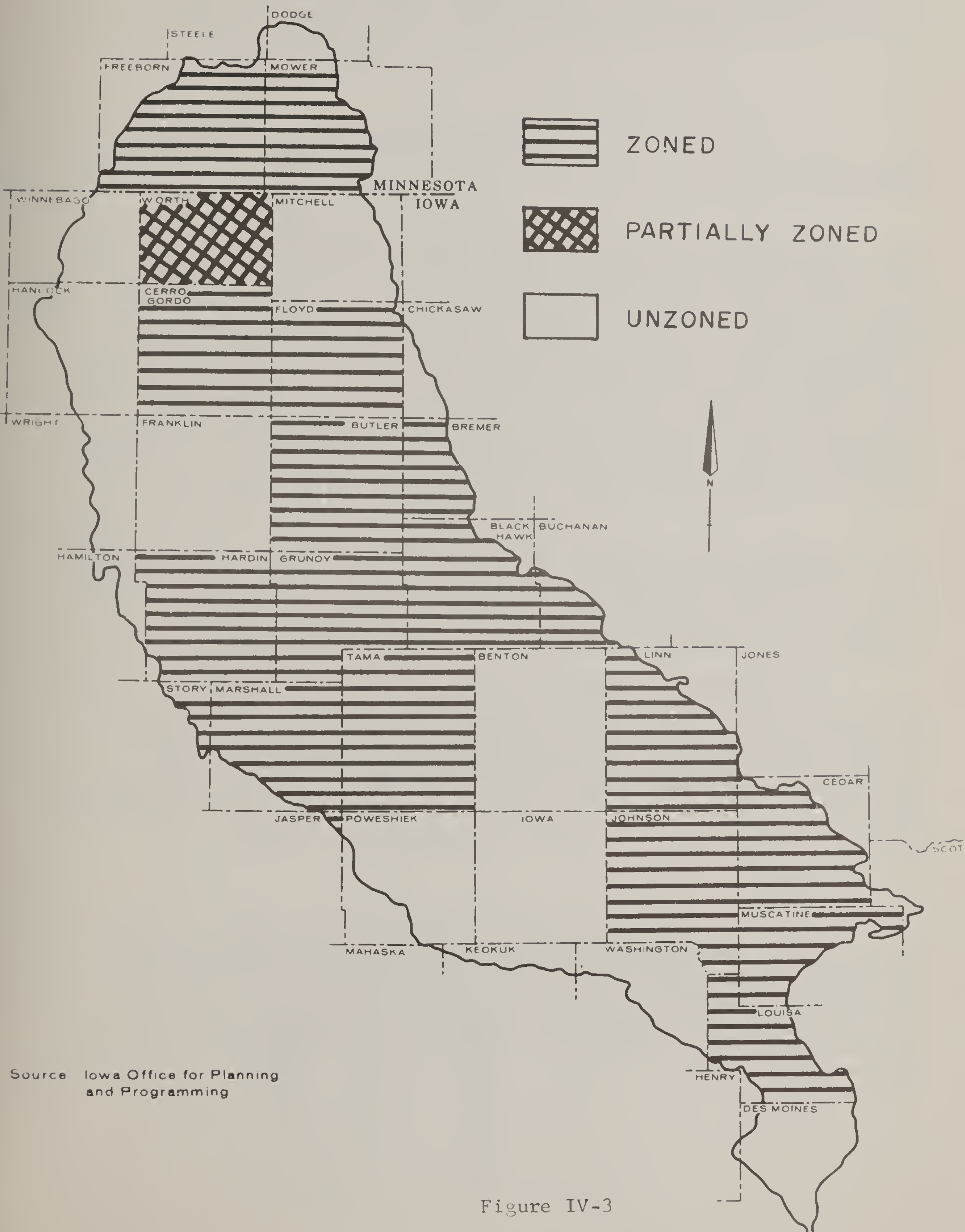
There are two types of surface water pollution sources: (1) Waste that is discharged from an identifiable source, a point source,

TABLE IV-5
FOREST LAND TREATMENT NEEDS - 1970
Iowa-Cedar Rivers Basin

Measures	Subbasins									TOTAL		
	Iowa	Cedar			W. Fork Cedar	Shell Rock			Flint			
		Iowa	Minn.	Total		Iowa	Minn.	Total		Iowa	Minn.	Basin
	(acres)											
Reforestation	43,680	23,152	2,956	26,108	1,386	4,714	714	5,428	7,000	79,932	3,670	83,602
Timber Stand Improvement	51,634	50,948	2,956	53,904	2,430	2,321	2,550	4,871	8,000	115,333	5,506	120,839
Forage Improvement	31,256	29,347	470	29,817	2,232	1,918	765	2,683	4,400	69,153	1,235	70,388
Grazing Reduction	31,913	30,758	470	31,228	3,397	4,315	255	4,570	6,100	76,483	725	77,208

STATUS OF ZONING

IOWA-CEDAR RIVERS BASIN



Source Iowa Office for Planning and Programming

Figure IV-3

and (2) diffused wastes that reach water from general areas and not from an identifiable source, a non-point source. The two differ in the ease of which they can be controlled. Point sources may be controlled directly while non-point sources are difficult to control.

a. Point Sources of Pollution

Some examples of point sources are municipal sewage, urban storm runoff, industrial wastes, and animal wastes from livestock feeding operations.

The IOWA WATER QUALITY REPORT published by the Iowa Department of Environmental Quality reported that 97 percent of the population of the incorporated communities totaling 483,827 in the Iowa portion of the basin was served by wastewater treatment plants in 1970. Ninety percent of the population of 393,413 in the incorporated communities was served by wastewater treatment plants in 1950. The number served by subbasin in Iowa are shown in Table IV-6. The Environmental Protection Agency requires, by July 1977, that publicly owned treatment works achieve, at a minimum, BOD_5 (5 day Biochemical Oxygen Demand) effluent concentrations of 30 mg/l (milligrams per liter) and at least 85 percent BOD_5 removal. Table IV-7 summarizes current BOD_5 loadings and pounds of reduction necessary by July 1, 1977, for each river subbasin.

Urban storm runoff and industrial wastes present a different type of problem. The technology of treating these wastes needs improvement. The Iowa Department of Environmental Quality lists in Table IV-8 a summary of industrial point source discharges by subbasin. The Winnebago River Subbasin is the only area with complete information.

An inventory of cattle feedlots was made. The inventory results show that in 1972 there were approximately 3,500 feedlots in the Basin feeding more than 50 head each. It was estimated these feedlots have a capacity to feed 500,000 head. Using present Iowa criteria relating to lot size and stream proximity, there are approximately 200 feedlots that are potential pollution problems. Twenty of the lots feed more than 1,000 head and two lots feed over 6,000 head.

b. Non-point Pollutants

Non-point pollutants include sediment, agricultural chemicals, mine drainage, accidental spills of oil and other hazardous material, and other sources. Other pollutants may include such items as animal and vegetable residues washed from the land, runoff from commercial and industrial sites, highway salt, and air pollution that precipitates. This is not a complete listing but illustrates the diversity of this problem.

TABLE IV-6
MUNICIPAL WASTE TREATMENT BY RIVER BASIN
Iowa-Cedar Rivers Basin

Treatment Type	Iowa River Basin		Cedar River Basin (except Winnebago and Shell Rock)		Shell Rock River Basin		Winnebago River Basin	
	Number of Municipalities	Population	Number of Municipalities	Population	Number of Municipalities	Population	Number of Municipalities	Population
Imhoff, Septic Tank, or Solids removal	1	563	8	13,721	1	1,360		
Waste Stabilization Lagoon	24	20,073	30	20,748	3	2,274	2	1,223
Trickling Filter	18	76,711	34	308,466	3	4,472	2	4,965
Activated Sludge	9	43,216	4	38,520			1	31,951
Total		140,563		381,455		8,106		38,139
Municipalities W/O Treatment Facilities	29	5,835	28	7,263	4	1,209	4	1,257

TABLE IV-7

CURRENT MUNICIPAL BOD_5 LOADINGS AND POUNDS OF REDUCTION NECESSARY TO MEET EPA REQUIREMENTS

Iowa-Cedar Rivers Basin

River Basin	Number Current Pounds BOD_5 Loading from Muncipalities	Number Pounds BOD_5 Reduction Necessary By July 1977
Iowa River	3,821	967
Cedar River (except Winnebago and Shell Rock)	34,441	23,215
Winnebago	231	59
Shell Rock	120	3

Source: Iowa Department of Environmental Quality

TABLE IV-8

SUMMARY OF INDUSTRIAL POINT SOURCE DISCHARGES IN IOWA BY RIVER SUBBASIN

Iowa-Cedar Rivers Basin

	RIVER BASIN			
	Iowa River*	Cedar River (except Winnebago and Shell Rock*)	Shell Rock*	Winnebago
Cooling Water	3	19	0	2
Quarries and Mines	11	35	3	14
Food Processing**	8	9	2	0
Manufacturing**	7	16	0	4
Railroads	1	3	0	1
Other	2	2	0	0
TOTAL	32	84	5	21

Source: Iowa Department of Environmental Quality

*Incomple inventories

**It was noted in the Iowa Water Quality report that some of the food processing and manufacturing discharges are probably inflated, since some of these may only discharge cooling water to the receiving stream.

Sediment deposition in lakes and reservoirs is the most identifiable sediment problem. Pine Lake, Coralville Lake, Lake MacBride, Otter Creek Marsh, and Union Grove Lake in the Iowa Subbasin and Beeds Lake in the West Fork Cedar Subbasin have all received public attention because of sediment accumulation. Sediment decreases the availability of surface water storage, the water surface area, and the quality of the water in a lake or reservoir. These decreases reduce the overall value of the resource.

Sediment creates problems for recreation, fish and wildlife, and municipal and industrial water supply. It not only impairs full use for these purposes, but requires expensive corrective treatment. Critical sediment source areas significantly affect both local and Basin-wide developments as well as the esthetic value of the water resource.

Five major categories of water pollutants could originate in part on agricultural land and contribute to watershed pollution. These categories are: sediment, plant nutrients (fertilizer), waste with high oxygen demands (animal manures), infectious agents (fecal coliform and streptococci), and exotic organic chemicals (biocides).

Agricultural chemicals become a part of the water-sediment mixture that results from direct runoff. Fertilizer nutrients and biocide residues are the current identifiable agricultural chemicals reaching the water resource.

During the spring thaw, a great deal of organic matter reaches the drainage system and places unusual loads on the waters of the Basin. The problem appears to originate in non-tilled areas as well as tilled areas. It may be caused by all vegetation and not just cultured vegetation.

The number of livestock in the Basin will increase more than 60 percent by 2020. This increase in livestock will cause a large increase in animal fecal materials which could, if preventive measures are not taken, add to future pollution problems.

The movement of chemical fertilizers and biocides from agricultural lands is complex and many factors contribute to the intensity and concentrations which reach the receiving waters. Much of the complexity evolves from the diversity of the topographic, geologic, and climatic differences between areas which have been and those which have not been studied. The EPA publication "Methods for Identifying and Evaluating the Nature and Extent of Nonpoint Sources of Pollutants" is being used as guidelines for the evaluation of present and future pollution phenomena in the river Basin.

DISSOLVED SOLIDS CONCENTRATIONS OF WATER AVAILABLE FROM BEDROCK AQUIFERS

IOWA-CEDAR RIVERS BASIN

Source: Iowa Department of Environmental Quality

Figure IV-4

2. Potable Water Supply Problems and Needs

The variations in the year-to-year precipitation can and do cause water shortages. A reliable supply of water of adequate quality is generally available but may require excessive investment for users of small amounts. The Basin has an average annual precipitation of 32 inches. Recorded variations range from 18 inches, 56 percent of normal, to 47 inches, 147 percent of normal. These departures from normal contribute to the water related problems.

a. Municipal and Industrial

The principal source of municipal and industrial water is groundwater. The cities of Clear Lake, Cedar Rapids, and Iowa City use surface water either in total or partial fulfillment of their requirements.

The better quality waters in the Basin are those containing less than 500 mg/1 of dissolved solids. These waters are of the calcium bicarbonate or calcium magnesium bicarbonate type. Waters containing from 500 to 1000 mg/1 of dissolved solids are considered to be of fair quality. In some areas, ground water with concentrations of up to 1,500 mg/1 is used extensively, and is considered acceptable. These waters usually grade from calcium magnesium to the sodium type and from bicarbonate to sulfate or sulfate chloride types where the dissolved solids content increases (Figure IV-4).

The problem of supply is generally a problem of cost. Most of the high producing wells are deep and expensive. The wells in the northern subbasins are not as deep as those in the southern subbasins. Their total hardness concentrations are also less (Table IV-9). Figure IV-5 shows the location of these communities with water supply problems.

TABLE IV-9
SELECTED WELL DATA
Iowa-Cedar Rivers Basin

Subbasin	No. Wells	Avg. Depth Ft.	Depth Range Ft.	Hardness Range Total PPM
Cedar	43	690	70-1900	200-1200
Flint	11	730	80-1800	200-1700
Iowa	22	700	40-2100	200-1400
Shell Rock	14	400	120-1300	200-400
West Fork Cedar	11	440	30-1900	300-600

Source: Iowa Geological Survey

Cedar Rapids, Mason City, and Iowa City have all experienced a fluctuating ground water level. The seriousness of this fluctuation and its ultimate effect on ground water supply remains unknown.

In the Mason City area, the ground water levels were lowered 200 feet from 1912 to 1969. The general ground water levels have lowered 120 feet from 1942 to 1969. Current observations indicate that the cone of drawdown is approaching a stable condition if withdrawal rates remain nearly constant. Any increase in withdrawal rates would cause an additional ground water level decline. The rate of decline and its potential seriousness need further investigation.

In the Cedar Rapids area, the ground water levels in the Silurian-Devonian aquifer, have declined a maximum of 105 feet in the last 70 years. In the center of the cone of depression, a general decline of 1.6 feet per year for the period 1900-1966, or about 100 feet was observed. When the city of Cedar Rapids changed from surface water to ground water (completed in 1964) an overall decline of 40 feet in the alluvial aquifer has diverted water that formerly recharged the Silurian-Devonian aquifer. Apparently the alluvial flood plain of the Cedar River in this area is a ground water recharge area.

The present recharge of the Silurian-Devonian aquifer is not sufficient to balance heavy localized pumpage. The water levels continue to decline and pumpage costs increase. Additional research into the limitations of the aquifer and the potential to recharge it is needed. The Jordan aquifer is an alternate source but it is deep and the development of a well to utilize this aquifer is expensive.

In Iowa City, the ground water table is temporarily drawn down approximately 40 feet during the summer period of heavy usage. Each year, the overall water levels are progressively lower.

The maximum potential yield of the aquifers mentioned is not known. A continuing and expanded study to further define the ground water resource is needed. Research is also needed to show what the potential for ground water recharge is and where it might be most practical.

b. Rural and Domestic

Rural and domestic water supply problems are probably the same as those for municipal and industrial users. A study of rural water supply problems was not made. Comments at public meetings indicate supply and quality problems with shallow wells.

COMMUNITIES WITH WATER PROBLEMS
IOWA-CEDAR RIVERS BASIN

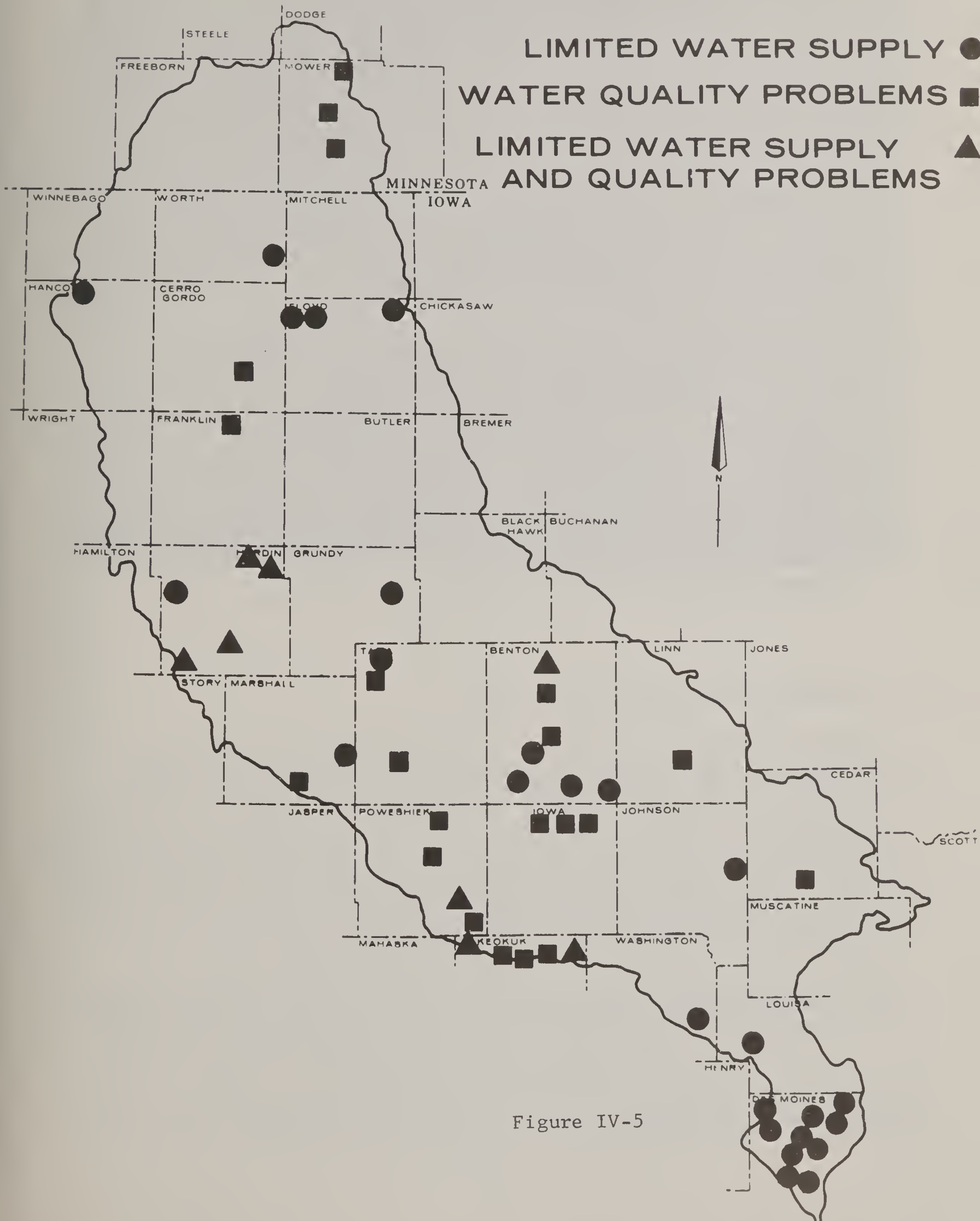


Figure IV-5

C. RECREATIONAL PROBLEMS AND NEEDS

A comparison of the total acreage demand required in each of the futures, 1980, 2000 and 2020, is shown in Table IV-10. On a total acreage basis, the Basin cannot meet the peak day recreation demand. Recreation requirements are expected to increase almost five-fold between 1970 and 2020. Recreation development will need to increase seven-fold from 1970 levels in order to meet the need.

TABLE IV-10
COMPARISON OF REQUIRED RESOURCES FOR PEAK OUTDOOR RECREATION
Iowa-Cedar Rivers Basin

Year	Requirements	1970 Supply	Need 1970-2020
	Acres		
1970	101,236	65,573	35,663
1980	144,567	65,573	78,994
2000	285,300	65,573	219,727
2020	502,548	65,573	436,975

Source: Outdoor Recreation in Iowa

D. FISH AND WILDLIFE PROBLEMS AND NEEDS

Wildlife problems and needs are related directly to the habitat quantity and quality as previously discussed. Fish habitat availability is a problem in the Basin and is most severe in the northern portion.

Pollutants reduce the water quality in receiving streams and reservoirs. This affects the ecosystem, including fish, by limiting the species to those that can survive in the modified environment. As a result large numbers of a few species exist. There is a need to identify and control pollutants to improve the quality of fish habitat.

Water quality in farm ponds is reduced when livestock have access to the pond area. This adversely affects sight feeding fish and destroys fish nesting areas. Shallow water is a problem which can lead to winter kill of fish in about 25 percent of the farm ponds. A basic problem of nearly all farm ponds is the lack of management for a quality fishery. There is a need for education of pond owners on the management of farm ponds for fish production.

SEDIMENT DEPOSITION IN CORALVILLE LAKE FROM HOOSIER CREEK

Reservoirs accumulate sediment and pesticides attached to the soil particles in sufficient quantities to adversely affect fish. Studies by Morris and Johnson,[1/] Iowa State Hygienic Laboratory, indicate that pesticides are adsorbed on soil particles and move into streams during rains or snow-melt runoff from cultivated land. Improved soil conservation practices resulting in reduced sedimentation need to be installed on a broad scale to keep agricultural pesticides on the fields and out of streams. The accumulation of sediment in streams and lakes with long life pesticides adhered to the soil particles is a problem that can affect the health of persons eating larger fish from these waters. Short life pesticides need to be developed and used which will reduce the amount of pesticides stored in the bottom sediments.

1/ Morris, Robert L. and Johnson, Lauren G., "Dieldrin Levels in Fish from Iowa Streams", Pesticides Monitoring Journal, U.S. Department of Health, Education, and Welfare, Public Health Service, Vol. 5, No. 1, June 1971.

Water impoundments in the northern portion of the Basin are for the most part, naturally occurring lakes or small dams on streams. Small dams accumulate sediment and its associated pesticides.

CHAPTER 5

EXISTING WATER AND RELATED LAND RESOURCE PROJECTS AND PROGRAMS

Numerous State, Federal, and local programs and activities are in operation and making significant contributions to the protection, preservation, and development of water and related land resources. The following tables list projects and programs that are available, to solve the problems and meet the needs of the Basin.

TABLE V-1
EXISTING WATER AND RELATED LAND RESOURCE PROJECTS AND PROGRAMS
Iowa-Cedar Rivers Basin

PROJECTS AND PROGRAMS	PARTICIPATING AGENCIES	BRIEF DESCRIPTION	FUNDING	LOCATION OF OFFICE THAT WILL PROVIDE ADDITIONAL INFORMATION
A. SOIL & WATER CONSERVATION	UNITED STATES DEPARTMENT OF AGRICULTURE			
	1. Soil Conservation Service	Provides technical assistance to landowners and operators in developing, applying and maintaining soil and water conservation measures. This was provided by Public Law 74-46, approved in 1935.	Federal	Soil Conservation District Field Office in each county
	2. Agricultural Stabilization and Conservation Service	Agricultural Conservation Program	Federal	Agriculture Stabilization and Conservation Service office in each county
		a. Provides cost-share funds to landowners in the year they install permanent soil and water conservation practices (Annual Program).		
		b. Cost-share funds for installing permanent soil and water conservation practices. Practices needed and year when individual measures will be installed are agreed upon prior to any work and cost-share payments are made when a practice has been installed (Long-Term Agreements Program).		
		c. The Forestry Incentives Program (FIP) is a cost-sharing forestry program in areas where timber production capabilities and opportunities are high.		
	3. Forest Service	Technical Assistance (see Forest Service Programs)	Federal	Iowa Conservation Commission, State Foresters Office
	IOWA DEPARTMENT OF SOIL CONSERVATION	Provides through the Soil Conservation Districts and the Conservancy Districts for the restoration and conservation of the soil and water resources of the State. It provides cost sharing for the installation of permanent soil conservation measures	Iowa	Soil Conservation District Field Offices

Table V-1
Existing Water and Related Land Resource Projects and Programs (Cont'd.)
Iowa-Cedar Rivers Basin

PROJECTS AND PROGRAMS	PARTICIPATING AGENCIES	BRIEF DESCRIPTION	FUNDING	LOCATION OF OFFICE THAT WILL PROVIDE ADDITIONAL INFORMATION
B. WATERSHED PROTECTION				
1. Watershed Development Program (Public Law 566)	Federal Agencies Soil Conservation Service Forest Service Fish and Wildlife Service	Assists local groups to plan, design, install, and maintain project measures for flood protection, irrigation, drainage, forestry, public recreation, fish and wildlife development, and municipal and industrial water supply. (Deer Creek Watershed Project in Worth County is the only one within the Basin in the construction stage. Applications have been filed for five others in Iowa and one in Minnesota.)	Federal (Cost-Share)	Soil Conservation District Field Office in each county.
2. Flood Control Projects (Small Flood Control Projects) (Public Law 80-856, 1948 Flood Control Act)	Office of Chief of Engineers, Department of the Army	Project designed and constructed by U.S. Army Corps of Engineers to reduce flood damages through projects not authorized by Congress. Each project selected must be engineeringly feasible, complete within itself, and economically justified.	Federal (Cost-share with local people paying for land rights and costs above $1,000,000)	U.S. Army Engineer District, Rock Island.
3. Authorized Flood Control Projects	Office of Chief of Engineers, Department of the Army	Projects designed and constructed by the U.S. Army Corps of Engineers to reduce flood damages through authorized projects. Existing projects include local protection at Marshalltown, consisting of a levee on the right bank of the Iowa River; at Waterloo, consisting of levees on both sides of the Cedar River and Black Hawk Creek within Waterloo; Coralville Lake above Iowa City authorized in 1938 and completed in 1958; and the Flint Creek Levee District No. 16 that includes 48 miles of agricultural levees from the Iowa River to Burlington, completed in 1970. Authorized in 1938 but deferred for restudy is the Rochester Lake that would be located on the Cedar River 2 miles north of Rochester in Cedar County.	Federal and Federal Cost-Sharing	U.S. Army Engineer District, Rock Island.

Table V-1

Existing Water and Related Land Resource Projects and Programs (Cont'd.)
Iowa-Cedar Rivers Basin

PROJECTS AND PROGRAMS	PARTICIPATING AGENCY	BRIEF DESCRIPTION	FUNDING	LOCATION OF OFFICE THAT WILL PROVIDE ADDITIONAL INFORMATION
	Office of Chief Engineers, Department of the Army	Detailed small flood control project reports have been made in Iowa for Iowa City, Chelsea, New Hartford, Evansdale, and one in progress for Marengo. One was also made on Turtle Creek in Minnesota. Reconnaissance Reports have been made on Vinton, Austin, Louisa County Levee District 11, Louisa County Levee District 8, and Marengo. In Minnesota one has been made on Goose Creek in Freeborn County.		
4. Floodplain Information Reports	Office of Chief Engineers, Department of the Army	Floodplain information reports have been made in Iowa on Black Hawk Creek, Black Hawk County; Cedar River, Black Hawk County; Cedar River, Linn County; Indian Creek and Dry Creek, Linn County; Prairie Creek, Linn County; Wapsinoonoc Creek, Muscatine County; Willow Creek, Cerro Gordo County; Winnebago River, Cerro Gordo County; and Winnebago River, Winnebago County.		
C. FORESTRY ASSISTANCE PROGRAMS	UNITED STATES DEPARTMENT OF AGRICULTURE Forest Service Soil Conservation Service Agriculture Stabilization and Conservation Service IOWA CONSERVATION COMMISSION Forestry Section MINNESOTA NATURAL RESOURCES DEPT., Forestry Section			
		Cooperative Forest Management provides: 1. Technical assistance to woodland owners and processors of forest projects, to improve and maintain the productivity of private forest lands.	Federal cannot exceed expenditure of State.	State Forester's Office

Table V-1
Existing Water and Related Land Reaource Projects and Programs (Cont'd.)
Iowa-Cedar Rivers Basin

PROJECTS AND PROGRAMS	PARTICIPATING AGENCIES	BRIEF DESCRIPTION	FUNDING	LOCATION OF OFFICE THAT WILL PROVIDE ADDITIONAL INFORMATION
		2. Assistance to States for tree planting and reforestation. Agriculture Act of 1956 Title IV. Cost-sharing on non-federal public landa for tree planting and reforestation. Cost-sharing and contractual aervices on private land. Technical assistance to private landowners.	Federal and State (coat-share). Private owner required to match funds provided by Rural Environmental Conservation Program.	
		3. Cooperative production and distribution of forest tree planting stock with the State Forestry Agency to provide tree planting stock at moderate prices. Clarke-McNary Act of 1924, Sec. 4.	Federal (cost-share)	
		4. Asaistance for watershed protection and flood prevention a. Cost-sharing assistance in project planning. b. Cost-sharing for critical area tree planting. c. Cost-sharing for acceleration of technical assistance in installing forestry measures on non-federal land.	Federal (cost-share)	Soil Conservation Service, Regional State Forestry Offices
		5. Forest Pest Control on private and public lands to reduce to tolerable levels losses caused by forest insects and diseases other than blister ruat. Provide leadership in prevention and detection, evaluation and suppression of foreat insect and disease outbreaka, and in developing cooperative control programs, and coat share in cooperative control on state and private lands.	Federal and State (cost-share)	

Table V-1
Existing Water and Related Land Resource Projects and Programs (Cont'd.)
Iowa-Cedar Rivers Basin

PROJECTS AND PROGRAMS	PARTICIPATING AGENCIES	BRIEF DESCRIPTION	FUNDING	LOCATION OF OFFICE THAT WILL PROVIDE ADDITIONAL INFORMATION
		6. Forest fire control for protection of forest resourcea from fire on private and public non-federal forest lands and certain non-forested watersheds under Clarke-McNary Act of 1924, Sec. 2. Fire protection is provided by the State Forestry Agency and its cooperators.	Federal and State (cost-share)	Iowa Conservation Commission (Forestry Section). Minnesota Department of Natural Resources (Forestry Section).
		7. General forestry assiatance	Federal	U.S. Forest Service, Northeastern Area State and Private Forestry
		a. Provides highly specialized technica forest management assistance.		
		b. Provides forest products processing advice.		
		c. Providea information and assistsnce in special programs such as regional development.		
		8. Forestry Incentive Programs	Federal	County ASCS Offices State Forestry Offices
		a. Cost-sharing for tree planting and forest management with landowners		
D. RECREATION, FISH AND WILDLIFE	1. IOWA CONSERVATION COMMISSION	a. Has responsibility for providing outdoor recrestion areas and facilities, more specifically on areas designated as State psrks, State preserves, natural lakes, and fish and game areas.	State	
		b. Fish and game management on both public and privste land in the state, more apecifically the stocking and regulation of harvest.		

Table V-1
Existing Water and Related Land Resource Projects and Programs (Cont'd.)
Iowa-Cedar Rivers Basin

PROJECTS AND PROGRAMS	PARTICIPATING AGENCIES	BRIEF DESCRIPTION	FUNDING	LOCATION OF OFFICE THAT WILL PROVIDE ADDITIONAL INFORMATION
		c. Administers the Land and Wster Conservation Fund, s Federal program providing financial aid to the State and political subdivisions for outdoor recreation programs and projects. Reviews all outdoor recreation plans prepared for County Conservation Boards and municipalities for participation in the Land and Water Conservation Fund Program. Also reviews projects submitted by agencies for Federsl Funding assistance.	State Federal	
		d. Responsible for developing a comprehensive outdoor recreation plan for the stste and implementing this plan.		
		e. Provides educationsl, informational, advisory, and research programs related to nstural resources.		
		f. Game Management Section provides individuals, County Conservation Boards, and sportsman's clubs assistance in planning game areas including development of marshes for the production of waterfowl as well as hunting. Trees and shrubs produced at State Nursery are provided at nominal cost for use of landowners to provide cover and hsbitat for wildlife and erosion control.	State cost-sharing	
		g. Fisheries Section provides initial brood fish stocking for farm ponds under certain conditions and provides technical advice on private water management. Also responsible for fishery management of state owned waters.		
	2. MINNESOTA DEPARTMENT OF NATURAL RESOURCES	Similar responsibilities and programs as the Iowa Conservation Commission.		

Table V-1
Existing Water and Related Land Resource Projects and Programs (Cont'd.)
Iowa-Cedar Rivers Basin

PROJECTS AND PROGRAMS	PARTICIPATING AGENCIES	BRIEF DESCRIPTION	FUNDING	LOCATION OF OFFICE THAT WILL PROVIDE ADDITIONAL INFORMATION
	3. Park Commissioners and Park Boards	Plan, purchase, maintain and administer public parks as provided in the Code of Iowa when a city exceeds a specified population.	Municipal	
	4. County Conservation Boards	Established by Iowa law to develop and manage parks and recreation areas. Plans are reviewed by Iowa Conservation Commission. Many recreational areas have been developed by them.	County and State with Federal cost sharing available for some projects.	County Conservation Boards
	5. UNITED STATES DEPARTMENT OF AGRICULTURE, Soil Conservation Service	Technical and cost-share assistance for water based recreation developments.	Federal Cost-Share	Soil Conservation District Offices
	6. DEPT. OF THE INTERIOR, Bureau of Outdoor Recreation	Coordinates, plans, and cost-shares for outdoor recreation activities.	Federal Cost-Share	
	7. DEPT. OF THE INTERIOR, National Park Service	Has developed and maintains facilities at West Branch, Iowa for Herbert Hoover Memorial.	Federal	
Pittman-Robertson and Dingell-Johnson Acts	8. DEPT. OF THE INTERIOR, Fish and Wildlife Service, IOWA CONSERVATION COMMISSION, MINNESOTA DEPARTMENT OF NATURAL RESOURCES	Federal excise taxes under these Acts are levied on sporting arms, ammunition, and fishing tackle, and distributed to states for restoration of fish and wildlife.	Federal	Iowa Conservation Commission Minnesota Department of Natural Resources
E. RESOURCE INVENTORIES				
1. River Basin Studies	14 Federal Agencies and 7 States	The Iowa-Cedar Rivers Basin was included in a comprehensive study of the Upper Mississippi River Basin. United States Department of Agriculture participation was to contribute to a comprehensive framework plan for the coordinated and orderly development, management, and use of the water and related land resources of the Upper Mississippi River Basin. Seven states and 14 Federal agencies were involved in this study. Summary of study presented in nine volumes.	Federal	Soil Conservation District Field Offices and many libraries have copies of this study.

Table V-1
Existing Water and Related Land Resource Projecta and Programs (Cont'd.)
Iowa-Cedar Rivera Basin

PROJECTS AND PROGRAMS	PARTICIPATING AGENCIES	BRIEF DESCRIPTION	FUNDING	LOCATION OF OFFICE THAT WILL PROVIDE ADDITIONAL INFORMATION
2. Soil Surveys	UNITED STATES DEPARTMENT OF AGRICULTURE, Soil Conservation Service	Field work and map preparation to delineate soils by type and further describe phyaical properties inherent to the soil. NOTE: Status of Soil Surveys is shown in Figure V-2.	Federal (accelerated by state or local financial inputs)	Soil Conservation District Field Offices, and other county officea.
3. Geological Survey				
a. "Drainage Areas of Iowa Streams"	Prepared by U.S. Geological Survey Water Division in 1957. Reprinted in 1974 by Iowa Highway Commission and Iowa Natural Resources Council.	Publication is a presentation of the drainage-area data for the interior streams of Iowa. Drainage area of all streams in excess of five square miles are listed.	Federal	
b. Water Quality Records (published annually)	U.S. Geological Survey, Dept. of the Interior in cooperation with Minnesota Department of Natural Resourcea, Minnesota Dept. of Highways, Corps of Engineers, U.S. Army, U.S. Environmental Protection Agency	Includes surface water records and water quality records in annual reports since 1961. Stream flow records have been kept since 1909 and water quality records since 1952 in Minnesota.	Federal State	Water Resources Division copies for Minnesota can be obtained from U.S. Geological Survey.
	In Iowa in cooperation with the Iowa Geological Survey, Iowa Highway Commission, Iowa Natural Resources Council, University of Iowa, Institute of Hydraulic Research, Iowa State University.	Includes surface water records, records in annual reports also since 1961. Annual water quality records have been released since 1964 either in the same report with surface water records or separate reports. Other stream flow data is available in reports with systematic collection of data under the State and Federal cooperative program in 1914.	Federal State	Water Resources Division Iowa Geological Survey
4. Inventory of Water Resources and water problems of Iowa-Cedar Rivers Basin in Iowa.	Iowa Natural Resources Council prepared in 1955.	The report recommends a number of measures relating to basic data, water use, and water control to alleviate existing conditions and to forstall the development of serious new problems.	State of Iowa	
Iowa's Water Resources Program Problems and Needs (Special Report). Appendix G lists reports dealing with land and wster resources.	Issued by Iowa Natural Resources Council in 1973.	Presents some of water problema of Iowa and presents needa for development of a framework plan of Iowa for control, utilization, and protection of the aurface and groundwater resources of the State.	State of Iows	Iowa Natural Reaources Council

Table V-1
Existing Water and Related Land Resource Projects and Programs (Cont'd.)
Iowa-Cedar Rivers Basin

PROJECTS AND PROGRAMS	PARTICIPATING AGENCIES	BRIEF DESCRIPTION	FUNDING	LOCATION OF OFFICE THAT WILL PROVIDE ADDITIONAL INFORMATION
5. Outdoor Recreation in Iowa, 1971	Developed by the Iowa Conservation Commission	This publication was prepared in response to the need for a long-range planning approach to provide for quality outdoor recreation in Iowa.	State of Iowa	Iowa Conservation Commission
6. Water Quality Management Plan - Interim Cedar River Basin, Minnesota, July 1971	Minnesota Pollution Control Agency, Division of Water Quality	Interim basin plan for water quality management specifically directed toward satisfying recent Federal regulations governing grants for construction of municipal works for liquid waste treatment.	State of Minnesota	Division of Water Quality
7. Water Quality Standards of Iowa, February 12, 1974	Iowa Department of Environmental Quality, Water Quality Commission	Developed and adopted to replace Standards originally adopted in 1967 and revision includes classification of streams and lakes for the first time. The State through Department of Environmental Quality is involved in a continued planning process that will reflect changes in technology available to control these sources.	State of Iowa	Iowa Department of Environmental Quality
8. Iowa-Cedar Rivers Basin Water Impoundments Opportunities Inventory Report	UNITED STATES DEPARTMENT OF AGRICULTURE, Soil Conservation Service	Lists water reservoir sites with drainage areas under 50 square miles that have potential to be used for storage of flood water and sediment, municipal and industrial water supply, and water for recreation and fish and wildlife developments. It also includes list of sites studied by the Corps of Engineers. Unpublished report by Soil Conservation Service made as part of the River Basin Study.	Federal	Soil Conservation District Offices
9. Iowa-Cedar Rivers Basin Legal Drainage Inventory Report	UNITED STATES DEPARTMENT OF AGRICULTURE, Soil Conservation Service	Inventory of Legal Drainage Districts in Iowa and Minnesota. Unpublished report by Soil Conservation Service as part of the River Basin Study.	Federal	Soil Conservation District Offices.
10. Iowa-Cedar Rivers Basin Corridor Study Report	UNITED STATES DEPARTMENT OF AGRICULTURE, Forest Service, Economic Research Service, Soil Conservation Service	Unpublished report by the Forest Service of River Corridors in Basin with classification for potential recreation development.	Federal	Soil Conservation District Offices

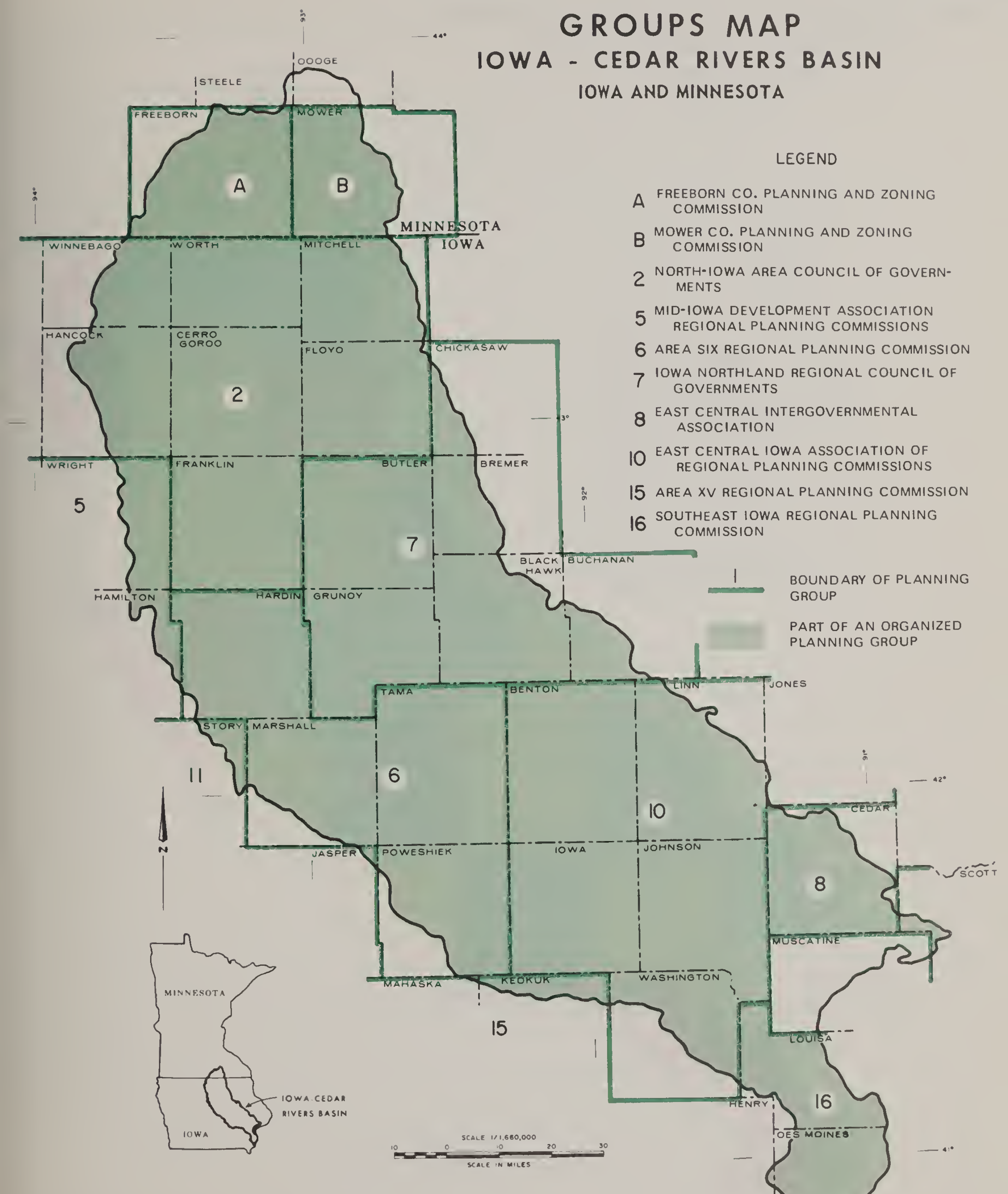
Table V-1
Existing Water and Related Land Resource Projects and Programs (Cont'd.)
Iowa-Cedar Rivers Basin

PROJECTS AND PROGRAMS	PARTICIPATING AGENCIES	BRIEF DESCRIPTION	FUNDING	LOCATION OF OFFICE THAT WILL PROVIDE ADDITIONAL INFORMATION
11. Iowa-Cedar Rivers Basin Recreation Needs Report	UNITED STATES DEPARTMENT OF AGRICULTURE, Forest Service, Economic Research Service, Soil Conservation Service, Iowa Conservation Commission	Unpublished report by Economic Research Service includes projected needs for recreation facilities for years 2000 and 2020.	Federal	Soil Conservation District Offices.
F. LOANS, CREDIT AND GRANTS	UNITED STATES DEPARTMENT OF AGRICULTURE, Farmers Home Administration	Provides assistance to farmers and rural groups for developing water supply and sewage systems. They also provide loans for grazing associations, resource conservation and development projects, forestry projects, soil and water conservation projects, watershed projects, fish and wildlife developments, and for rural recreation developments for both individuals and groups.	Federal	Farmers Home Administration Office
G. EDUCATION	Co-Operative Extension Service, Iowa State University Minnesota Extension Service	Extension Service works with other agencies carrying out educational programs including programs relating to soil and water management. The Service acts as the educational agency of the United States Department of Agriculture and the land grant universities.	Federal, State, and County	County Extension Offices
H. RESEARCH	1. UNITED STATES DEPARTMENT OF AGRICULTURE, Agricultural Research Service	Scientific data were developed through investigations in hydrology, hydraulics, erosion and sedimentation, water conservation, drainage, soil properties, soil-water-plant relationship, and control of contamination by agricultural chemicals and farm waste.	Federal	County Extension Offices

Table V-1
Existing Water and Related Land Resource Projects and Programs (Cont'd.)
Iowa-Cedar Rivers Basin

PROJECTS AND PROGRAMS	PARTICIPATING AGENCIES	BRIEF DESCRIPTION	FUNDING	LOCATION OF OFFICE THAT WILL PROVIDE ADDITIONAL INFORMATION
	2. UNITED STATES DEPARTMENT OF AGRICULTURE, Economic Research Service	Economic Research Service conducts national and regional programa of research, planning, and technical consultation, and services pertaining to economics and institutional factors and policies relating to the uae, conservation, development, management and control of natural resources. An erosion study has been completed for the Basin. Study includes the required land use to control sediment to acceptable amounts.	Federal and State	County Extension or Soil Conservation District Offices
I. LEGAL DRAINAGE DISTRICTS	Board of County Supervisors	Following the enactment of the first Drainage Laws in Iowa and Minnesota, legal drainage districts were organized in large numbers. In an inventory made as part of thia study, five hundred and twenty-eight districts were inventoried in Minnesota and Iowa with a total drainage area of more than 610,000 acres.	Private	County
J. WATER AND AIR QUALITY CONTROL, SOLID WASTE DISPOSAL, CHEMICAL USAGE CONTROL, RELATED RESEARCH AND DATA COLLECTIONS, RESEARCH AND CONSTRUCTION GRANTS	UNITED STATES ENVIRONMENTAL PROTECTION AGENCY Iowa Department of Environmental Quality Iowa Natural Resources Council Minneaota Pollution Control Agency	Activities to prevent, control and abate water and air pollution, federal solid waste disposal programs, claasify and control use of agricultural chemicals	Federal (Construction grants; research grants)	Iowa Department of Environmental Quality Minnesota Pollution Control Agency
K. COUNTY AND MULTI-COUNTY REGIONAL LAND AND WATER RESOURCE PLANNING	Nine County or Multi-County Regional Planning Commiasions	Authorized by State documents. Figure V-1 shows boundariea of Regional Planning Commissiona in the Baain.	County, Municipal, Federal, State	Officea generally in major metropolitan area.
L. ARCHEOLOGICAL AND HISTORIC	UNITED STATES DEPARTMENT OF THE INTERIOR, National Park Service, IOWA STATE ARCHEOLOGIST, IOWA STATE HISTORIC PRESERVATION OFFICER. MINNESOTA HISTORICAL SOCIETY	Provides aervicea to identify, register, and preserve sites having unique archeological or historic value.	Federal and State	Iowa City, Iowa St. Paul, Minnesota

ORGANIZED REGIONAL PLANNING GROUPS MAP
IOWA - CEDAR RIVERS BASIN
IOWA AND MINNESOTA



SOURCE:

SCS DRAWING NO. 5,O-28,270.1 (4/74) AND INFORMATION FROM FIELD TECHNICIANS. LAMBERT CONFORMAL CONIC PROJECTION.

Figure V-1

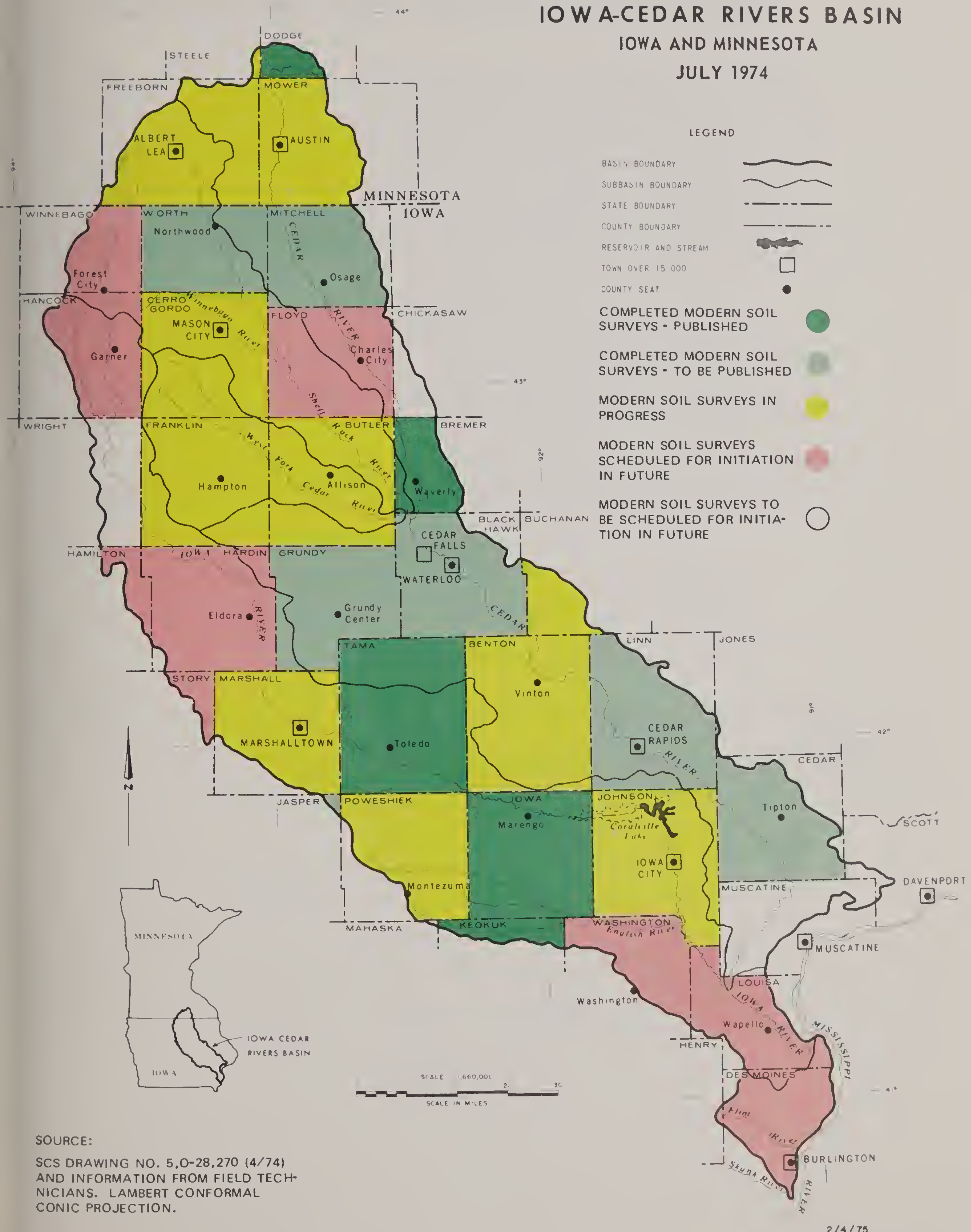
1/24/75
5,N-34,944

STATUS OF SOIL SURVEYS MAP

IOWA-CEDAR RIVERS BASIN

IOWA AND MINNESOTA

JULY 1974



SOURCE:

SCS DRAWING NO. 5,0-28,270 (4/74) AND INFORMATION FROM FIELD TECHNICIANS. LAMBERT CONFORMAL CONIC PROJECTION.

USDA-SCS LINCOLN, NEBR. 1975

Figure V-2

CHAPTER 6

OPPORTUNITIES FOR DEVELOPMENT

This chapter presents the opportunities available for solving identified problems and for meeting anticipated needs within the Basin, through programs administered by Federal, State, or local governments. Application of land treatment measures can be done only when the individual land user or landowner is motivated to do so. Other measures such as flood prevention, municipal and industrial water, or recreational development require group or community action. Assistance is available to land users from several existing programs administered by State and Federal agencies.

A. LAND TREATMENT AND LAND USE MEASURES

The full development and utilization of the soil resources will require application of needed land treatment on the 4.94 million acres needing treatment. There are 2.87 million acres adequately treated, 37 percent of the total agricultural land.

Table VI-1 shows that the largest acreage needing treatment is on cropland. The three major land uses, crop, pasture and forest each have needs on nearly 70 percent of the acreage.

TABLE VI-1

CURRENT STATUS OF AGRICULTURAL LAND TREATMENT

Iowa-Cedar Rivers Basin

Land Use	Total Acreage	Adequately Treated		Needing Treatment	
		Total	Percent	Total	Percent
	- - - - - - - - - -	- - 1,000 acres - -	- - - - - - - -	- - - - - -	- - - -
Cropland	6,568	2,364	36	4,204	64
Pasture and Range	669	207	31	462	69
Forest and Woodland	310	103	33	207	67
Other Agricultural Land	256	191	75	65	25
Total Agricultural Land	7,803	2,865	37	4,938	63

Estimated land treatment accomplishment under existing or going programs are shown in Table VI-2. The Soil Conservation District Program includes all cost sharing and technical assistance available. The projections are based upon the accomplishments from 1967 through 1973, a 6-year base period. It is estimated that by the year 2020 an additional 2.7 million acres of cropland, 324,000 acres of pasture, 32,000 acres of forest land and 50,000 acres of other land uses will be receiving adequate land treatment.

The table also shows that under present rates, 22 percent of the cropland, 21 percent of the pasture, and 56 percent of the forest land will not be adequately treated 50 years from now.

The opportunities for cropland treatment were divided into five alternatives. Four of the alternative treatments are to control erosion and one to control wetness. The selected treatments are as follows:

(1) For slightly sloping land, minimum tillage practices were selected as the most likely alternative,

(2) For moderately sloping land, contouring along with minimum tillage was selected,

(3) For moderate to steep soils strip cropping or terracing was assumed as being the most likely alternative,

(4) Where the soils are very steep and the erosion can not be reduced to a tolerable level by treatments, the alternative selected was to change the land use to permanent cover, either grass or trees,

(5) For soils with a wetness problem surface and subsurface drainage systems were selected.

The land treatment program for pasture land was divided into three categories of actions. Where the plant population is adequate and involved acceptable species, the management program was using fertilizer, weed control and rotation grazing. Where these conditions did not exist, then pasture re-establishment was one solution and the conversion of pasture to woodland was the other.

The needs for forest or woodland treatment are for reforestation and timber stand improvement. Elimination of livestock grazing is an overlapping need and on the same acres having other needs. The estimated land treatment costs by 2020 are shown in Table VI-3.

TABLE VI-2

ESTIMATED LAND TREATMENT ACCOMPLISHMENTS BY 2020

Iowa-Cedar Rivers Basin

Conservation Treatment	Present Needs	Going Program	Remaining Needs in 2020
	---------- Acres ----------		
Cropland			
Minimum Tillage	886,000	700,000	186,000
Contouring with Minimum Tillage	1,236,000	970,000	266,000
Strip Cropping & Terracing	792,000	400,000	392,000
Permanent Cover	162,000	100,000	62,000
Drainage	1,128,000	530,000	598,000
Subtotal	4,204,000	2,700,000	1,504,000
Adequately Treated	2,364,000		5,064,000
Total	6,568,000		6,568,000
Pasture			
Pasture Management	340,000	255,000	85,000
Pasture Re-establishment	98,000	68,000	30,000
Tree Planting	2,000	1,000	1,000
No Feasible Treatment	22,000	0	22,000
Subtotal	462,000	324,000	138,000
Adequately Treated	207,000		531,000
Total	669,000		669,000
Forest			
Reforestation	86,000	28,000	58,000
Timber Stand Improvement	121,000	4,000	117,000
Subtotal	207,000	32,000	175,000
Adequately Treated	103,000		135,000
Total	310,000		310,000
(Elimination of Grazing **	77,000	40,000	37,000)
(Erosion Control **	77,000	40,000	37,000)
*Other Land			
Needing Treatment	65,000	50,000	15,000
Adequately Treated	191,000		241,000
Total	256,000		256,000

*Non-federal rural land. It includes farmsteads, farm roads, feed lots, ditch banks, fence and hedge rows, non-farm residences, investment tracts, and the like.

**These practices are on areas already in forest land treatment program.

TABLE VI-3
COST OF PRESENT LAND TREATMENT PROGRAM BY 2020
Iowa-Cedar Rivers Basin

Land Use	Installation Cost	Technical Assistance	Totals
	------------1000's Dollars----------		
Forest	2,000	1,000	3,000
Cropland	77,000		
Pasture	8,000	72,000*	160,000
Other	3,000		
TOTAL	90,000	73,000	163,000

*This is an annual cost of $0.20/acre, based on Fiscal 1973 data. It is not possible to separate this cost by land use.

B. WATER SUPPLY AND WATER QUALITY

The greatest pollutant, by volume, of streams and reservoirs has been identified as sediment. The principal source of sediment is from agricultural land. Sediment combines with phosphate, nitrogen, and other agricultural chemicals and affects water quality.

Conservation measures control erosion. These measures are identified in section VI.A. along with opportunities for their installation.

Reservoir sites throughout the Basin were inventoried and 192 identified as having physical potential for water storage. Many of these would be suitable for storage of water for community or industrial uses. A few of these could be included in small watershed projects under Public Law 566 and be developed as multiple-purpose reservoirs with municipal and industrial water storage added. Cost sharing is not available for this purpose under the current program. With other purposes paying for a large portion of the cost, a relatively economical reservoir can be obtained for municipal and industrial water storage.

Twelve potential downstream sites were identified. Some would have adequate capacity to supplement stream flow during dry periods to improve downstream water quality. Figure VI-1 shows the approximate location of all identified sites.

C. FISH AND WILDLIFE

Only a small portion of the Basin is publicly owned, therefore opportunities to develop fish and wildlife population are greatest on privately owned land. Land use, the most important factor affecting wildlife population, is controlled by man and subject to change.

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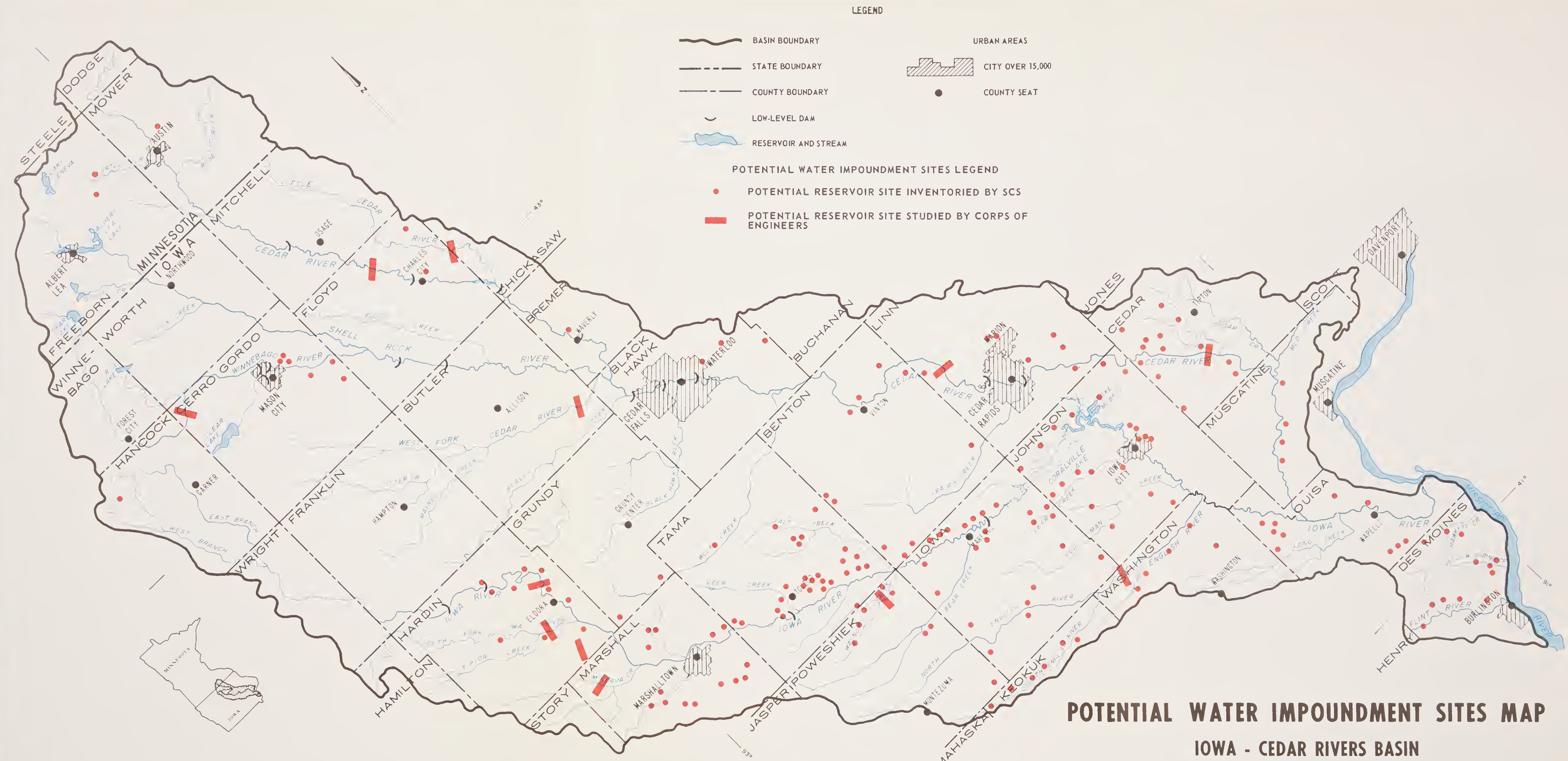

POTENTIAL WATER IMPOUNDMENT SITES MAP

IOWA - CEDAR RIVERS BASIN

IOWA AND MINNESOTA

Figure VI—1

SOURCE:

FAMILY OF MAPS SCS DRAWING NO. 5,S-32,382 (5/74). U.S. ARMY CORPS OF ENGINEERS, AND INFORMATION FROM FIELD TECHNICIANS. LAMBERT CONFORMAL CONIC PROJECTION.

USDA-SCS-LINCOLN, NEBR 1975

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to prevent spreading. The SCS plant materials program could work toward selction or development of a shrub suitable for this purpose.

Most of the previously mentioned opportunities are available now. Publicizing these opportunities to land users by all groups interested in resource conservation would help convert opportunities into wildlife. Other opportunities are available; however, they will require more effort. Several involve research and could affect the income of land users.

D. RECREATION

Future plans for recreational development--both new areas and expansion of existing sites--include opportunities by State, regional, county, city, Federal, and private enterprises.

1. State

State recreation plans have been developed for both Iowa and Minnesota. A number of new recreational areas, in addition to expansion of existing ones, are planned for future acquisition and development. Appendix D-3 lists these recreation sites to be developed.

2. Regional, County, and City

Regional, county, and city governments currently have plans for acquiring and developing recreational sites. These include both water-based and land-based sites for high intensity recreational use, dispersed recreational use in greenbelts, and other kinds of open space lands, county forests, and environmental corridor developments. Appendix D-4 indicates the geographic location and magnitude of these planned developments.

3. Federal

Currently the Soil Conservation Service and the Corps of Engineers are studying potential reservoir sites within the Basin. These future developments could include both water-based and water-related recreational activities.

a. Soil Conservation Service

Multiple-purpose reservoir opportunities include potential dam sites throughout most of the Basin. Most of the sites are located in the south-central part of the Basin where the greatest need is likely to occur in the future. Potential reservoir sites and areal extent are shown in Table VI-4. The average size of the recreation pool is 204 surface acres.

TABLE VI-4
POTENTIAL RESERVOIR SITE INVENTORY SUMMARY *
SOIL CONSERVATION SERVICE
Iowa-Cedar Rivers Basin

Subbasin	No. of Sites	Recreation Pool (Ac.)	Recreation Land (Ac.)
Cedar R. - Ia.	38	7,323	21,969
- Minn.	3	620	1,860
Flint R.	11	2,995	8,985
Iowa R.	120	24,595	73,785
Shell Rock R.	6	825	2,475
W. Fk. Cedar R.	-	-	-
Iowa Total	175	35,738	107,214
Minn. Total	3	620	1,860
Grand Total	178	36,358	109,074

* Summarized from Water Impoundment Opportunities Study, Iowa-Cedar Rivers Basin Study.

Data on the location of inventoried sites, storage capacities, and water surface areas, is available on request from the Soil Conservation Service. While these reservoir sites are shown as multiple-purpose developments, some could be developed for recreation.

b. Corps of Engineers

The Corps of Engineers has studied twelve potential reservoir sites in the Basin--four in the northern part, four concentrated in the central part, and four in south-central. All are located in Iowa. Investigations of these sites were reconnaissance level using available data. Both water-based and water-related recreational activities could be included, if any of these sites are developed. The average surface water area, based on ten reservoirs with acreage estimates, is about 7,900 acres.

Table VI-5 summarizes the number of sites and related water areas by Subbasin. The largest site being studied is the Finchford Reservoir on the West Fork Cedar River with an estimated water surface area of 24,000 acres.

TABLE VI-5

POTENTIAL RESERVOIR SITES*
STUDIED BY THE U.S. ARMY, CORPS OF ENGINEERS
Iowa-Cedar Rivers Basin

Subbasin	No. of Sites	Reservoir Area (acres)
Cedar River	4	16,040**
Iowa River	6	38,630
Shell Rock River	1	No estimate
West Fork Cedar River	1	24,000
Flint River	None	None
Iowa Total	12	78,670
Minnesota Total	None	None
Grand Total	12	78,670

*Summarized from Water Impoundment Opportunities Study, Iowa-Cedar Rivers Basin Study.

**Acreage shown is for 3 reservoirs; no estimate available for the other one.

4. Private Sector

There is a potential for future private recreational developments and additional development of existing sites. In many cases, the private owner or operator can provide facilities for recreational activities that the government sectors would not ordinarily provide. These developments could then complement State, regional, county, local, and Federal developments. Normally, these developments would include hunting preserves, fishing lakes, horseback riding farms, recreational trailer parks, and other specialized developments. Unfortunately, no estimate of these types of planned developments is available. In addition, Soil Conservation Service technicians inventoried 1315 farm ponds within the Basin. Eighty-five percent of the farm ponds, over 1,100, occur in the southern half of the Basin.

Of the sites inventoried, 1,255 ranged from 1 to 5 acres in size, 42 ranged from 5 to 10 acres, and 18 ranged from 10 to 25 acres.

The large concentration of farm ponds within the south central part of the basin becomes quite important in helping supply future recreational needs since a large portion of the total projected need is expected to occur in this area. It is possible that landowners within this high recreation demand area could benefit monetarily by developing limited recreational facilities adjacent to their farm ponds. No estimates are available indicating the magnitude of this sector of recreation supply as it relates to projected future needs. Appendix D-5 shows soil limitations for various recreational uses.

E. RESOURCE CONSERVATION AND DEVELOPMENT PROJECTS

The RC&D (Resource Conservation and Development Program) was authorized by the Food and Agriculture Act of 1962. It expands opportunities for conservation districts, local units of government, and individuals to improve their communities in multiple-county areas. Measures and technical assistance eligible for funding through RC&D that would improve water quality or supply are:

1. Critical area treatment (erosion and sediment control).

2. Soil and water management for agriculture-related pollutant control. Practices may include, but not limited to, holding ponds, diversions, terraces, and community distribution systems.

3. Accelerated services may be also provided to assist a community where severe erosion and sediment problems in a drainage basin above the water supply reservoir are adversely affecting the quantity and quality of water.

4. Multiple-purpose considerations. Although RC&D financial cost-share assistance may not be provided, sponsors should be encouraged to include multiple-purpose uses wherever practical. Municipal and industrial water could be included as a part of public water-based fish and wildlife or recreational development. A proposal has been made, but not yet approved, to include municipal and industrial water as eligible for financial assistance.

No existing RC&D project is located within the Basin. However, opportunities do exist for the establishment of such projects. Interest has been shown in organizing an RC&D project in the lower end of the Basin which includes Louisa, Henry, Des Moines, and Lee Counties.

F. POTENTIAL WATERSHED DEVELOPMENT

The opportunity to reduce land and water resource problems through project action were divided into two groups. Where the watershed has local interest, and was found physically and economically feasible it was considered an "early action" project. A watershed that had potential for development but did not have local interest at this time was placed in the "long range" development group (Figure VI-2).

The physical and economic data on the "early action" projects are shown in Tables VI-6 and VI-7.

TABLE VI-6

AVERAGE ANNUAL BENEFITS AND COSTS OF STRUCTURAL MEASURES - POTENTIAL EARLY ACTION DEVELOPMENTS

Iowa-Cedar Rivers Basin

Potential Development	AVERAGE ANNUAL BENEFITS Total	AVERAGE ANNUAL COSTS Total
	- - - - - - - - Dollars	- - - - - - - -
Ralston Creek	272,000	224,000
W. Branch Iowa River	1,163,000	364,000
Drainage District #3	213,000	62,000
Turtle Creek	570,000	248,000
Total	2,218,000	898,000

The total installation cost of the four "early action" projects is $12.2 million. The annual cost using 5 7/8 percent interest rate for amortization is $898,000 with an annual benefit of $2.2 million. In addition to the "early action" projects there are a number of watersheds that have potential for project development but are not organized or ready now. These are grouped as "long range" potential. They are shown on Figure VI-2 in yellow. The yellow areas north and west of Marshall County are potential flood prevention drainage projects. They were not studied in detail but were identified on the basis of past experience. The watersheds

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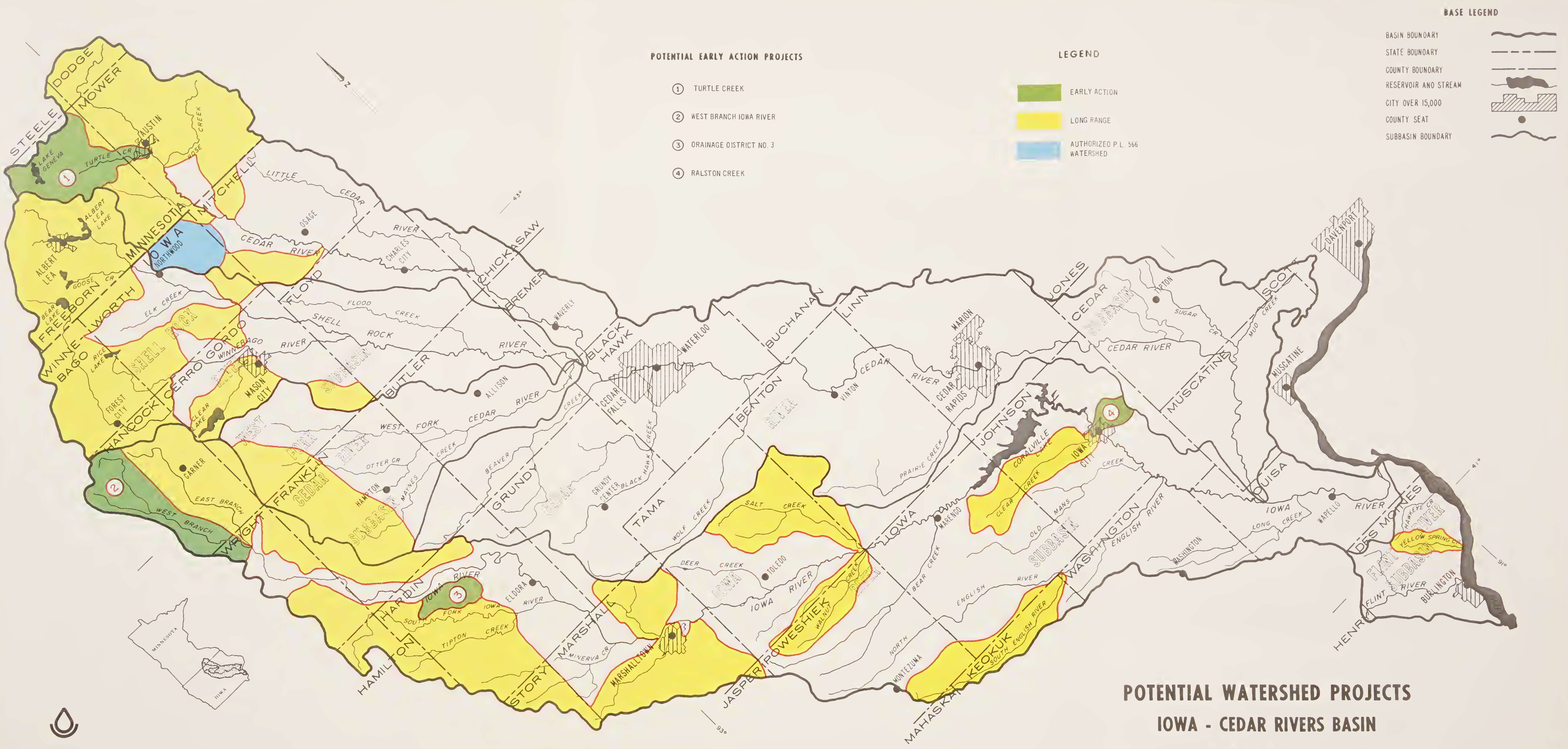
SOIL CONSERVATION SERVICE



POTENTIAL WATERSHED PROJECTS

IOWA - CEDAR RIVERS BASIN

IOWA AND MINNESOTA

SCALE 1/850,000

SCALE 10 0 10 20 30 40 MILES

Figure VI—2

SOURCE: FAMILY OF MAPS SCS DRAWING NUMBER 5,S-32,382 (REV. 5-15-74) AND INFORMATION FROM SCS TECHNICIANS. LAMBERT CONFORMAL CONIC PROJECTION.

USDA-SCS-LINCOLN, NEBR. 1974

6-11-74
5,S-34,313

TABLE VI-7

SUMMARY OF STRUCTURAL MEASURE DATA - POTENTIAL EARLY ACTION PROJECTS

Iowa-Cedar Rivers Basin

Potential Development	Drainage Area	RESERVOIR DATA								CHANNEL DATA				Total Install. Costs
		D.A. Controlled	No. of Struc.	Storage Capacity										
				Sed.	F.W.	Other	Total	Addn'l Storage Available	Install. Costs	Length	Land Rights	Area Ben.	Install. Costs	
	Acre	Acre		Ac. Ft.	Ac.Ft.	Ac.Ft.	Ac.Ft.	Ac.Ft.	$1,000	Mile	Acre	Acre	$1,000	$1,000
Ralston Crk.	5,600	2,870	4 *	480	1,310	-	1,790	6,380	3,000	-	-	-	-	3,000
W. Br. Iowa R.	95,000	-	-	-	-	-	-	-	-	38.0	830	21,000	4,900	4,900
Drain Dist. #3	15,000	-	-	-	-	-	-	-	-	1.6	100	6,900	900***	900
Turtle Crk.	96,000	-	5	-	-	-	-	-	-	18.7 **	NA	12,000	3,400	3,400
TOTAL	211,600	2,870	9	480	1,310	-	1,790	6,380	3,000	58.3	830	39,900	9,200	12,200

* Includes 5,000 ft. diversion, 0.95 mile.

** 14.1 miles floodway diversion, 2 miles floodways, 2.6 miles channel modification, and 5 pumping plants.

*** D.D. #3 includes 23 miles of underground tile.

in Marshall County and south were studied in some detail. Potential reservoirs were located, water surface profiles and flood routings were made. Potential benefits for the "long-range" projects were also evaluated.

An important phase of a small watershed project is the land treatment measures planned to be installed before, or concurrently with, the structural measures. The acres and costs of the land treatment program within these projects was not determined in detail. During more detailed planning, estimates can be made that lead to additional funds for land treatment acceleration within the project areas.

G. NEW PROGRAMS OR AUTHORITIES

1. Flood Hazard

The Flood Hazard Analysis Program is one of the new USDA programs that provides an opportunity to identify flood prone areas. The cooperative Flood Hazard Analysis Program provides basic technical data about flood hazards in flood plain areas. Reports developed as a result of flood hazard analyses are used by states, municipalities, planning commissions, and other units of government responsible for land use planning and flood plain regulation.

A flood hazard analysis is generally the result of a cooperative agreement between a local unit of government, the responsible state agency, and the Soil Conservation Service. An agreed-to plan of study outlines the responsibilities of each of the cooperating units. At the present time there are no cooperative flood hazard analyses being carried out in the Basin.

CHAPTER 7

EFFECTS OF PROGRAMS

Land and water resource development can be accomplished through (1) USDA programs now in effect, (2) State funded programs, (3) local projects, (4) Corps of Engineers and other federal agencies, and (5) new federal, state or local programs or authorities.

The discussion on the effects of programs that follows does not specify which of the above opportunities will be used in order to implement potential developments. The effects of works of improvements upon the Basin land and water resources and their effects upon the Basin population will be discussed.

The potential developments will affect the physical landscape, culture, and economy of the Basin. Not all of these effects can be quantified in similar units. In some instances, they are not readily identifiable and may not become apparent until a development program is implemented.

Proposals set forth in this report are directed toward improvement in the quality of life through contributions to the objectives of national economic development and environmental quality.

A. EARLY ACTION PROJECTS

1. Hydrology

There are three reservoirs in the early action projects, all in Ralston Creek Watershed. Their combined drainage area is 4.5 square miles, 51 percent of the watershed area. These reservoir sites offer the opportunity to store 1,840 acre-feet of runoff. They could be used to make 220 acres of multiple-purpose lakes.

There are three early action projects, West Branch Iowa River, Turtle Creek and Drainage District No. 3 Watersheds, that involve multiple-purpose water management. The management of runoff water to reduce flood damages and provide drainage are the purposes for development of these projects. Extensive hydraulic modeling on two of the three projects studied failed to reveal significant downstream effects.

2. Sedimentation

Watershed protection with the application of needed land treatment measures will reduce erosion on farm and forest land. Reducing erosion helps maintain the productive ability of the land so that food may be produced at minimum cost.

Land treatment measures are effective for local sediment control and water quality improvement. About 50 percent of the gross eroded sediment from a specified one square mile watershed, is delivered to the outlet. On a watershed with a 100 square mile drainage area, 13 percent of the total erosion is delivered. The fact that local water quality is easier to improve than downstream water quality is particularly significant because there are many more miles of small streams than large ones. In LRA 108, each square mile of land has two miles of streams. In LRA 103 each square mile has one mile of stream.

West Branch Iowa River Watershed

The West Branch Iowa River is a 95,000 acre (149 square mile) watershed that lies along the northwestern edge of the Iowa-Cedar Rivers Basin. It joins the East Branch Iowa River at Belmond to form the Iowa River. The West Branch flows generally south and slightly east. Soils and topography are typical of LRA 103, the Central Iowa and Minnesota Till Prairies.

The major problem is 21,000 acres of nearly level land with excess water adjacent to the river. Most of this land consists of peat or muck soils which does not have adequate drainage for agricultural crop production. Existing drainage systems generally lack needed capacity. There are also other soils that have inadequate drainage.

The West Branch in Wright County is a steep, natural channel on limestone. The rock bottom ends near the Hancock-Wright County line and the remainder of its length is man made. The existing ditch was dug in the early 1900's and has inadequate capacity to protect the agricultural land from excess water. The stream has one-half foot per mile gradient for the first 12 miles into Hancock County.

The existing 38 miles of ditch can be enlarged to meet agricultural drainage needs. Design and development of the proposed channel modification can be accomplished so fish and wildlife values associated with the present system can be mitigated and enhanced. This modification would require replacement of at least seven county road bridges and involve approximately 4 million cubic yards of excavation. An additional 830 acres of rights-of-way is also needed.

The project installation cost is $4.9 million. The annual benefits would be $1,163,000 with annual costs of $364,000. The project cost includes $503,100 for mitigation of wildlife habitat. Studies determined there were no adverse downstream effects.

Ralston Creek Watershed

Ralston Creek is a 5,600 acre (8.75 square mile) east bank tributary of the Iowa River. It flows through Iowa City in Johnson County, Iowa in a westerly direction. The watershed elevation changes 180 feet in four and one-half miles, about 40 feet per mile. The soils and topography are typical of LRA 108, the Illinois and Iowa Deep Loess and Drift area.

Floodwater and sediment from Ralston Creek has caused major damage in Iowa City in 1932, 1941, 1950, 1956, 1962, 1965, 1967 and 1972. Eight floods have occurred in forty years for an average of one major flood every five years.

The proposed project includes three floodwater retarding dams which would control 51 percent of the watershed area along with a floodwater diversion. These measures could protect Iowa City from a 100 year flood event from Ralston Creek.

The project installation cost is estimated to be $3 million or an annual cost of $224,000. The annual benefits are estimated to be $272,000.

Turtle Creek Watershed

Turtle Creek Watershed is located in the northeast corner of Freeborn County, Minnesota, with a small portion in Mower County. It outlets into the Cedar River at Austin, Minnesota. The drainage area is 96,000 acres (150 square miles).

This watershed is located entirely in LRA 103. The perimeter of the watershed has from low to moderate relief and drains toward the center area. The central part is an old lake bed with no appreciable relief. This flat area was peat soil when the area was first drained at the turn of the century. Subsidence has taken place and little of this peat remains.

Eighty percent of the land is used as cropland. The uplands are used largely for production of corn and soybeans, and the central portion is used for production of sugar beets, potatoes, onions, corn, and soybeans. There are 12,000 acres in the central area subject to excess water problems. The major problem is lack of gradient from Hollandale to Austin. When the Cedar River is flooding, water can back into the Hollandale area.

Proposed structural measures to meet project objectives include the following: 14.1 miles of floodway diversions, 2.0 miles of floodways, 2.6 miles of channel work, and five pumping stations. These measures would protect the problem area from outside water and could provide a system for water level management.

The cost of installation of structural measures is estimated to be $3.4 million. The total annual cost, including operation and maintenance, would be $248,000 with annual benefits of $569,600.

Drainage District No. 3

Drainage District No. 3 is located in the west-central portion of the Basin in Hardin County. The drainage area is 15,000 acres (23.4 square miles). The original Drainage District No. 3 installation included a hydraulically improved channel 8 miles long. This channel provides an outlet for tile mains in 15 other legal drainage districts or subdistricts along with many other tile lines within the watershed area of Drainage District No. 3. Ninety-two percent of this watershed is cropland.

This watershed is located entirely in LRA 103. The topography is gently undulating with many depressional and low lying areas. These depressional areas flood frequently and many other areas have crop damage from excess water. About 6,900 acres of existing cropland would benefit from an improved drainage system. A proposed system of 23 miles of tile mains and 1.6 miles of channel work would provide the needed drainage.

Project benefits would include increased crop yields, decreased production costs, and the opportunity to use optimum planting and fertilizer rates. Installation costs were estimated to be $921,100. Including operation and maintenance, the annual cost would be $62,000 and annual benefits would be $224,200.

B. ALTERNATIVE ACTIONS

Table VII-1 is a summary of alternatives to solve the problems and meet the identified needs of the Basin. The effects of these alternatives are also summarized.

TABLE VII-1

DISPLAY OF PLAN ELEMENT EFFECTS AND OPPORTUNITIES

Iowa-Cedar Rivers Basin

Plan Element	Economic Effects 1/ Beneficial (000) -average	Adverse (000) annual-	Environmental Effects Beneficial and Adverse	Social Well-Being Beneficial and Adverse Effects	USDA Opportunities	Other Opportunities
1. Erosion control. Apply land treatment on 2,544,000 acres of crop, pasture and other land. (On-going Program)	Benefits not evaluated	2/ -	Reduce erosion and sediment yield from 2,544,000 acres. Improve water quality. Enhance wildlife habitat. Protect ecosystems.	Approximately 70% of costs to be borne by region. Create 322,500 man-days of low to medium income employment. Increased output from expected shift in crop patterns.	SCS technical assistance ASCS cost share FmHA loans and grants	Iowa Dept. of Soil Conservation. Iowa-Cedar Conservancy District. Iowa Conservation Commission - Forestry and Wildlife Sections. Soil Conservation Districts. Minn Minnesota Dept. of Natural Resources.
2. Drainage. Install adequate drainage on 1,128,000 acres (On-going Program); and install adequate drainage on 598,000 acres (accelerated program).	$115,910	$28,600 plus $1,530 O&M	Reduced potential for vectors, i.e. mosquitos. Increased visual quality of vegetation. Reduced upland wildlife habitat. Decreased landscape diversity.	Creates regional income. Approximately 85% of costs to be borne by region. Creates 900,000 man days of low to medium income employment.	SCS technical assistance ASCS cost share FmHA loans and grants	Group drainage projects utilizing existing State Drainage District laws. Project development under existing drainage laws. Individual action.

Plan Element	Economic Effects[1] Beneficial (000) -average annual-	Adverse (000)	Environmental Effects Beneficial and Adverse	Social Well-Being Beneficial and Adverse Effects	USDA Opportunities	Other Opportunities
3. Forestry. Install adequate forest treatment measures on 207,000 acres (On-going Program); and install adequate forest treatment measures on 175,000 acres (accelerated program).	$1,700	$1,200	Reduce soil erosion on 77,000 acres. Improve wildlife habitat on 207,000 acres. Improve hydrologic conditions on 207,000 acres.	Approximately 80% of costs to be borne by region. Provide a year-round diversity of environment. Provide 1,035,000 recreation day opportunities. Create 32,000 man days of low to medium income employment.	Forest Service Cooperative Forest Programs with Iowa Conservation Commission ASCS cost share SCS technical assistance	Iowa Conservation Commission.
4. Environmental corridors. Preserve or enhance 60,700 acres of environmental corridor. Intensify wildlife management.	$1,200	$ 800	Improve recreation quality and environmental diversity. Change present land use and improve wildlife habitat conditions. Preserve archeological sites and protect scenic values.	Reduce tax base on 60,700 acres. Provide 607,000 recreation visits annually. Relocation of a few families and farm enterprises. Disruption of tranquility of landscape. Increased noise levels.	SCS technical assistance ASCS cost sharing BOR financial assistance	Iowa Conservation Commission
5. Floodwater and Sediment Management.	$2,200	$ 900	Reduce excess water problems on 40,000 acres of agricultural land and reduce flood risk to 600 residential and 55 commercial properties. Create water areas. Improve visual diversity and recreational opportunity by creation of open water areas.	Approximately 30% of costs to be borne by region. Create 38,000 man days of low to medium income employment. Increased output from expected shift in crop patterns. Reduce hazard to well-being of residents. Relocation of individuals and families.	SCS PL-566 program	Iowa-Cedar Conservancy District. Corp of Engineers.

1/Amortized 50 years at 6 1/8%.
2/ Total estimated installation costs $115,127,100.

Sheet 2 of 2

CHAPTER 8

COORDINATION AND PROGRAMS FOR FURTHER DEVELOPMENT

In the Iowa-Cedar Rivers Basin some potential development will not be feasible or applicable under United States Department of Agriculture programs. There are needs for which programs are not presently available.

The water and land resources, problems, and needs were inventoried. Potential solutions and/or alternatives were identified. Special emphasis was placed on the problems and needs identified by the State sponsors and the public. Successful implementation of the opportunities presented in this report will depend on coordination with other Federal, State, and local agencies and ultimately upon acceptance by the people.

A. ALTERNATIVE APPROACHES

An alternative to meeting conservation needs for erosion control is to continue present soil and water conservation programs. Present programs will satisfy some needs, but will not supply all. Cost sharing and technical assistance will need to be increased above current rates as a result of increasing costs and more sophisticated criteria.

An environmentally oriented plan could be developed with environmental objectives as the prime consideration. This plan would emphasize the improvement of fish and wildlife resources, recreational developments, the enhancement of environmental corridors, reforestation, pollution abatement, water quality improvement, and beautification programs.

B. PROJECTS OR MEASURES NEEDED BUT NOT PRESENTLY AVAILABLE THROUGH USDA

Resource Conservation and Development projects could be used to develop and carry out long-range programs to increase the returns from the resource base. Resource Conservation and Development projects are needed to accelerate ongoing resource conservation programs. The organization of such a project would facilitate resource planning by increasing the available funds for planning and application.

The water bank program could be used to insure a constant and necessary amount of wetlands in the Basin. Diversification of the landscape is necessary to provide adequate habitat for many forms of wildlife. This program would compensate landowners to offset taxes and decrease incentive to farm or pasture these lands.

C. OTHER AGENCY PROGRAMS AND THEIR IMPACTS

The Agricultural Stabilization and Conservation Service administers, on a cost sharing basis, a program of land treatment and improvement. These measures materially improve watershed protection. Land treatment programs concentrated on areas upstream from reservoirs reduce sediment, prolong life, and benefit the community.

The U.S. Army Corps of Engineers has a program to build large reservoirs such as Coralville Lake to reduce flood damages on the larger streams. Coralville Lake receives an average of 1,200 acre feet of sediment per year. Studies show that if gross erosion could be kept at or below 5 tons per acre per year in the Marshalltown to Coralville Lake area, the sediment accumulation in the reservoir would decrease by over one-third.

Land treatment measures on the areas above these reservoirs are not planned in conjunction with the project. The land treatment program is limited to that provided by the ongoing programs of the Department of Agriculture, and is a result of the actions of independent landowners. Emphasis is needed on a program to promote land treatment and land use adjustment.

D. NEW PROGRAMS OR CRITERIA TO MEET NEEDS

Changes in present authorities, as well as new programs, are needed to develop the resources in the Basin. Emphasis is needed on a program to promote the shifting of present improper land use to uses that meet the land's capabilities. This could include cost-sharing on clearing forest or brushy areas better suited to farming and/or the forestation of crop and pastureland better suited to forest or wildlife use.

Land use planning expertise is needed to provide highway designers and urban developers with physical information which will enable them to provide adequate safeguards to the Basin's water and land resources. The Soil Conservation Service can provide soils data pertaining to the physical suitability of soils for road or house building, construction of sanitary disposal systems, drainage characteristics, and other information about the capabilities of the soils for nonagricultural use. Specific legislation or ordinances requiring soil suitability surveys to be made prior to construction would insure more satisfactory developments.

A federal wood bank program should help preserve and utilize existing small private forest lands. Such a program would compensate landowners to offset taxes and lessen any monetary incentive to clear these lands. Standards and eligibility could be determined by the appropriate State and Federal agencies. All forms of forest resource utilization would be appropriate providing such practices conform to multiple use and sustained yield objectives.

To help satisfy present and future recreational demand, there is a need for additional state and local programs. These should provide land for recreational use, the development of recreational facilities, and the protection of potential recreational resources. In most cases, this can be accomplished by providing incentives for the development and use of private land for recreational purposes. Present state programs that provide easements and rights-of-way on private land for access to lakes, rivers and streams need to be accelerated. Through special programs, counties and municipalities could provide more local parks and recreational areas. There is considerable land in the Basin that has potential value for recreation. Attempts should be made to preserve as much of this land as possible. Ideally, these areas should be preserved by outright acquisition, but this may be impractical because of the high cost. Other ways of providing protection to this land would be flood plain zoning, tax deferment, setback requirements, and easements.

E. POTENTIAL UTILIZATION BEYOND NEEDS OF BASIN

The Basin has the capacity to exceed baseline production levels. This production could be utilized to satisfy unmet demands arising from such sources as increased exports or unexpected increases in domestic demands.

This analysis of capability was made under the assumptions that product prices would not be reduced by production above the baseline level and that this extra production would still be profitable to the producer. Total production was determined under these assumptions and the limitations that the Basin must still produce its nationally allocated baseline share. Development, such as cropland drainage, was allowed to be incorporated as long as it returned a greater value than its cost.

APPENDICES

APPENDIX A-1

LAND CAPABILITY CLASSIFICATION

Iowa-Cedar Rivers Basin

A. Land suited for cultivation and other uses including pasture, range, woodland, or wildlife.

Class I — These soils have few or no conditions that limit their use. They can be safely cultivated without special conservation treatment.

Class II — These soils have some natural condition that limits the plants they can produce or that calls for some easily applied conservation practice when they are cultivated.

Class III — These soils have more serious or more numerous limitations than those in Class II. The limitations may be natural ones, such as steep slope, sandy or shallow soil or too little or too much water. Or the limitation may be erosion accelerated by the way the land has been used. Thus they are more restricted in the crops they can produce or, when cultivated, require conservation practices more difficult to install and maintain.

Class IV — These soils have very severe limitations that restrict the plants they can grow or the number of years they will produce a cultivated crop. When cultivated, they require very careful management. In humid areas, they are suitable for occasional but not regular cultivation; in subhumid and semiarid areas, crops fail in low-rainfall years.

B. Land generally not suitable for cultivation but suitable for other uses.

Class V — These soils have little or no erosion hazard but have some condition impractical to remove that limits their use largely to pasture, range, wood production, recreation, water supply, or wildlife food and cover.

Class VI	These soils have severe limitations that make them generally unsuited for cultivation and restrict their use largely to pasture, range, wood production, recreation, water supply, or wildlife food and cover.
Class VII	These soils have very severe limitations that make them unsuited for cultivation and that restrict their use to pasture, range, wood production, recreation, water supply, or wildlife food and cover with careful management.
Class VIII	These soils and land forms have limitations that prevent their use for commercial plant production and that restrict their use to recreation, water supply, or wildlife food and cover with careful protection.

APPENDIX A-2

LAND CAPABILITY CLASSES BY LAND USE*

Entire Basin

Iowa-Cedar Rivers Basin

Class	Cropland	Pasture	Forest	Other	Total	Per-Cent
I	1,064,100	48,100	10,500	37,600	1,160,300	15
II	3,550,000	304,600	60,900	124,300	4,039,800	52
III	1,548,900	140,200	50,500	69,800	1,809,400	23
Total I-III	6,163,000	492,900	121,900	231,700	7,009,500	90
IV	219,900	48,400	24,500	11,900	304,700	4
Total I-IV	6,382,900	541,300	146,400	243,600	7,314,200	94
V	14,800	39,700	83,900	2,300	140,700	2
VI	121,800	45,300	25,900	4,800	197,800	2
VII	48,800	42,900	53,800	5,500	151,000	2
VIII	0	0	0	0	0	0
Total V-VIII	185,400	127,900	163,600	12,600	489,500	6
TOTAL	6,568,300	669,200	310,000	256,200	7,803,700	100

Sheet i of 3

Appendix A-2

LAND CAPABILITY CLASSES BY LAND USE*

Iowa Portion

Iowa-Cedar Rivers Basin

Class	Cropland	Pasture	Forest	Other	Total	Per-Cent
I	1,005,900	46,200	10,100	34,300	1,096,500	15
II	3,205,900	287,400	58,600	106,800	3,658,700	51
III	1,405,100	125,200	47,000	59,200	1,636,500	23
Total I-III	5,616,900	458,800	115,700	200,300	6,391,700	89
IV	216,700	47,500	24,100	11,700	300,000	4
Total I-IV	5,833,600	506,300	139,800	212,000	6,691,700	93
V	14,800	39,700	83,900	2,300	140,700	2
VI	119,500	44,200	25,300	4,400	193,400	3
VII	48,800	42,900	53,800	4,800	150,300	2
VIII	0	0	0	0	0	0
Total V-VIII	183,100	126,800	163,000	11,500	484,400	7
TOTAL	6,016,700	633,100	302,800	223,500	7,176,100	100

Sheet 2 of 3

Appendix A-2

LAND CAPABILITY CLASSES BY LAND USE*

Minnesota Portion

Iowa-Cedar Rivers Basin

Class	Cropland	Pasture	Forest	Other	Total	Per-Cent
I	58,200	1,900	400	3,300	63,800	10
II	344,100	17,200	2,300	17,500	381,100	61
III	143,800	15,000	3,500	10,600	172,900	28
Total I-III	546,100	34,100	6,200	31,400	617,800	99
IV	3,200	900	400	200	4,700	**
Total I-IV	549,300	35,000	6,600	31,600	622,500	99
V	0	0	0	0	0	0
VI	2,300	1,100	600	400	4,400	**
VII	0	0	0	700	700	**
VIII	0	0	0	0	0	0
Total V-VIII	2,300	1,100	600	1,100	5,100	1
TOTAL	551,600	36,100	7,200	32,700	627,600	100

* Total geographic area 8,301,440 acres; total land area 8,269,970 acres; total water area 31,470 acres.

Sheet 3 of 3

** Less than 1 percent.

Source: USDA Conservation Needs Inventory.

APPENDIX A-3

ACREAGE DISTRIBUTION OF SRG's (SOIL RESOURCE GROUPS) BY SUBBASIN
Iowa-Cedar Rivers Basin

SRG	Iowa North Half	Percent Distribution	Iowa South Half	Percent Distribution	Iowa Special Study Area	Percent Distribution
1	422	*	17,788	1.6	22,346	2.4
2	290,944	35.1	353,110	31.3	225,899	24.1
3	106,567	12.9	318,325	28.3	313,111	33.4
4	9,688	1.2	26,959	2.4	42,363	4.5
5	0	-	0	-	0	-
6	0	-	10,928	1.0	6,383	0.7
9	0	-	2,934	0.3	0	-
10	10,490	1.3	5,620	0.5	1,581	0.2
10ND	13,588	1.6	3,342	0.3	0	-
11	0	-	418	*	0	-
12	0	-	6,275	0.6	2,981	0.3
13	205	*	9,055	0.8	1,748	0.2
14	20,725	2.5	8,130	0.7	597	*
15	10,080	1.2	11,394	1.0	8,174	0.9
16	939	0.1	10,216	1.0	2,214	0.2
18	32,457	3.9	129,888	11.5	122,142	13.0
18PD	2,206	0.3	7,630	0.7	13,133	1.4
18ND	2,206	0.3	7,630	0.7	13,133	1.4

*Less than 0.5 percent.

Sheet 1 of 6

Appendix A-3 (continued)

SRG	Iowa North Half	Percent Distribution	Iowa South Half	Percent Distribution	Iowa Special Study Area	Percent Distribution
19	0	-	C	-	0	-
19PD	0	-	1,262	0.1	0	-
19ND	0	-	1,262	0.1	0	-
20	169,600	20.5	23,739	2.1	22,357	2.4
20PD	59,214	7.2	5,054	0.4	3,450	0.3
20ND	59,214	7.2	5,054	0.4	3,450	0.3
21	0	-	0	-	0	-
22	11,819	1.4	242	*	0	-
22PD	7,741	0.9	0	-	204	*
23	10,319	1.2	25,894	2.3	23,229	2.5
23PD	401	*	2,271	0.2	2,100	0.2
25	0	-	6,677	0.6	0	-
28	8,527	1.0	122,180	10.8	102,779	11.0
29	878	0.1	3,140	0.3	4,671	0.5
Total	828,280	100.0	1,126,417	100.0	938,045	100.0

*Less than .05 percent.

Sheet 2 of 6

Appendix A-3 (continued)

SRG	Cedar North Half	Percent Distribution	Cedar South Half	Percent Distribution
1	3,807	0.3	4,307	0.2
2	473,932	41.4	890,959	45.0
3	50,439	4.4	380,854	19.2
4	4,569	0.4	42,549	2.1
5	49,870	4.4	2,524	0.1
6	4,051	0.3	610	*
9	0	-	206	*
10	16,816	1.5	9,833	0.5
10ND	26,300	2.3	6,984	0.3
11	0	-	406	*
12	0	-	0	-
13	13,100	1.2	52,719	2.7
14	71,941	6.3	30,809	1.6
15	16,936	1.5	64,111	3.2
16	13,637	1.2	15,364	0.8
18	11,283	1.0	113,437	5.7
18PD	3,583	0.3	18,313	0.9
18ND	3,583	0.3	18,313	0.9

*Less than .05 percent.

Sheet 3 of 6

Appendix A-3 (Continued)

SRG	Cedar North Half	Percent Distribution	Cedar South Half	Percent Distribution
19	466	*	0	-
19PD	0	-	0	-
19ND	0	-	0	-
20	107,437	9.4	121,820	6.1
20PD	102,211	8.9	46,291	2.4
20ND	102,211	8.9	46,291	2.4
21	36,739	3.2	0	-
22	15,692	1.4	200	*
22PD	0	-	200	*
23	3,596	0.3	65,183	3.3
23PD	2,695	0.2	1,854	0.1
25	286	*	4,250	0.2
28	2,027	0.2	33,264	1.7
29	6,476	0.6	10,069	0.5
Total	1,143,683	100.0	1,981,720	100.0

*Less than .05 percent.

Sheet 4 of 6

SRG	Shell Rock	Percent Distribution	West Fork	Percent Distribution	Flint	Percent Distribution
1	3,068	0.3	1,161	0.2	2,424	1.3
2	408,028	38.1	225,270	42.9	62,371	32.9
3	89,685	8.4	53,047	10.1	29,129	15.4
4	15,825	1.5	4,441	0.8	661	0.3
5	16,860	1.6	2,864	0.5	0	-
6	2,631	0.3	0	-	881	0.5
9	0	-	188	*	0	-
10	24,872	2.3	993	0.2	5,695	3.0
10ND	9,406	0.9	5,863	1.1	1,102	0.6
11	566	*	0	-	221	0.1
12	0	-	188	*	221	0.1
13	6,708	0.6	5,205	1.0	3,525	1.9
14	76,102	7.1	24,174	4,6	220	0.1
15	24,084	2.3	16,068	3.1	4,698	2.5
16	11,685	1.1	3,465	0.7	4,627	2.4
18	21,182	2.0	14,385	2.7	5,421	2.9
18PD	3,616	0.3	5,764	1.1	11,975	6.3
18ND	3,616	0.3	5,764	1.1	0	-

*Less than 0.5 percent.

Appendix A-3 (continued)

SRG	Shell Rock	Percent Distribution	West Fork	Percent Distribution	Flint	Percent Distribution
19	0	-	0	-	1,763	0.9
19PD	0	-	0	-	8,642	4.5
19ND	0	-	0	-	0	-
20	144,684	13.5	27,886	5.3	6,083	3.2
20PD	76,928	6.6	54,912	10.5	9,694	5.1
20ND	70,928	6.6	54,912	10.5	0	-
21	4,795	0.5	196	*	0	-
22	29,863	2.8	810	0.2	0	-
22PD	16,618	1.6	5,450	1.0	0	-
23	3,467	0.3	6,052	1.1	8,489	4.6
23PD	0	-	580	0.1	220	0.1
25	0	-	0	-	4,417	2.3
28	7,865	0.7	3,528	0.7	16,479	8.7
29	3,349	0.3	2,222	0.4	663	0.3
Total	1,070,431	100.0	525,388	100.0	189,621	100.0

*Less than .05 percent.

Sheet 6 of 6

APPENDIX B-1

SRG (SOIL RESOURCE GROUP) DESCRIPTION
Iowa-Cedar Rivers Basin

CODE	DESCRIPTION	IOWA LCU*	IOWA DISTRIBUTION (%)	MINNESOTA LCU*	MINNESOTA DISTRIBUTION (%)	MAJOR SOILS	SLOPE	TEXTURE CLASS	PROBLEMS
1	Deep, well to somewhat poorly drained, medium to moderately fine textured bottomland soils. Moderately to moderately slowly permeable. Fine textured lower Horizons may be encountered throughout the lower portion of the profile.	I a11	58	IIW41	100	Nodaway	Level to gently sloping 0-2%	Silt loam	Minor flooding
		I a12	42						
2	Deep, well and somewhat poorly drained, medium to moderately fine textured, some lacustrine and upland soils. Moderately to moderately slow permeable. Bedrock or gravel may be encountered deep within the profile.	I a41		I-02	26	Tama	Level to gently sloping	Silt loam	Somewhat poorly drained
		I c11		I-03	10	Downs			
		I c13		I-04		Racine			
		I c14		IIE02	16	Kenyon			
		I c15		IIE03	41	Clinton			
		IIEa41		IIE04		Fayette			
		IIEc11	43	IIE29		Dubuque			
		IIEc13				Muscatine			
		IIEc14				Mahaska			
		IIEc15							
		I b11	24						
		I b12	5						
		IIWm82	6						
		IIEm82							
		IIEb11							
		IIWL11							
		IIEb12							

*Only LCU's with areas greater than 500 acres are shown.

Sheet 1 of 7

Appendix B-1 (Continued)

CODE	DESCRIPTION	IOWA LCU	IOWA DISTRIBUTION (%)	MINNESOTA LCU	MINNESOTA DISTRIBUTION (%)	MAJOR SOILS	SLOPE	TEXTURE CLASS	PROBLEMS
3	Deep, moderately well and well drained, medium and moderately fine textured upland soils. Moderate to moderately slowly permeable. Some areas of calcareous soils are included.	IIIEa41 IIIEb12 IIIEc11 IIIEc13 IIIEc14 IIIEc15 IIIEc16	 82 16	IIIE03 IIIE04 IIIE02 IIIE10 IIIE29	61 23	Tama Downs Racine Ostrander Dodgeville Clinton Fayette Dubuque	Gently sloping 5-14%	Silt loam	Erosion
4	Deep, moderately well to drained, moderately fine textured upland soils. Moderate to moderately slowly permeable. Some calcareous soils are included.	IVEc11 IVEc16 IVEc14 IVEd11	56 40	IVE03 IVE04 IVE10	50 25 25	Tama Downs Racine Ostrander Dodgeville Clinton Fayette Dubuque	Moderately steep 14-18%	Silt loam	Erosion
5	Deep, moderately well drained, moderately fine to fine textured upland soils. Moderately slowly to slowly permeable soils, with firm to very firm subsoils.	IIWd11 IIEd11 IIEd12	12 85	IIS19 IIE19	92 8	Cresco Lindley	Level to gently sloping 2-5%	Loam	Erosion
6	Deep, moderately well drained, moderately fine to fine textured upland soils. Moderately slowly to slowly permeable soils, with firm to very firm subsoils.	IIEd11 IVEd21	25 75	IIIE22 IIIS19	50 50	Cresco Lindley	Sloping 5-14%	Loam	Erosion

Appendix B-1 (Continued)

CODE	DESCRIPTION	IOWA		MINNESOTA		MAJOR SOILS	SLOPE	TEXTURE CLASS	PROBLEMS
		LCU	DISTRIBUTION (%)	LCU	DISTRIBUTION (%)				
9	Poorly drained upland soils. Very fine textured soils on side slopes.	IVEf11 IVWf11	33 66			Clarinda	Sloping to moderately steep 5-14%	Silty clay loam	Erosion and wetness
10	Deep, somewhat poorly to poorly drained upland soils with moderately fine to very fine textured subsoils. Level. Some fine textured material over sandy substrata is included. Moderately slowly to very slowly permeable.	IIWm11 IIIWn11 IIIWn12 IIIWn61 IIWm62 IIIWn31 IIIWm11	7 29 52	IIIW10 IIIW12 IIIW20	58 10 32	 Adair Keswick	Level 0-2%	Silt loam	Wetness
11	Deep, moderately well to somewhat poorly drained upland soils, with fine textured subsoils. Very slowly to slowly permeable.	IIIEe21	100			Adair Keswick	Gently sloping to sloping 2-9%	Silt loam	Erosion and seepy
12	Deep, moderately well to somewhat poorly drained upland soils with fine textured subsoils. Very slowly permeable.	IVEe21 IVEe22	90 10			Adair Keswick	Moderately steep 9-14%	Silt loam	Erosion and seepy

Sheet 3 of 7

CODE	DESCRIPTION	IOWA LCU	IOWA DISTRIBUTION (%)	MINNESOTA LCU	MINNESOTA DISTRIBUTION (%)	MAJOR SOILS	SLOPE	TEXTURE CLASS	PROBLEMS
13	Well to excessively drained upland soils. Includes soils shallow to bedrock or sand and gravel and deep sandy soils.	IVSh11 IVSk12	 98			Sogn Hagener Chelsea	Level to sloping 0-14%	Sand	Erosion and moderately low moisture holding capacity
14	Well to somewhat poorly drained, moderately deep (24-40") medium to moderately fine textured upland soils overlying sand and gravel or bedrock and deep moderately coarse textured soils.	IISi11 IISi12 IIEi11 IIEi12 IIEj11 IIEi21	44 46 5	IIS24 IIS25 IIE23 IIS23 IIE24 IIIE11	58 8 8 13	Dickinson	Level to gently sloping 0-5%	Loam	Low moisture holding capacity
15	Well to somewhat poorly drained, moderately deep (24-40"), medium to moderately fine textured upland soils overlying sand and gravel or bedrock. Deep moderately coarse textured soils are included.	IIIEi11 IIIEi12 IIIEi21 IIIEj11 IVEd12 IVEi11 IVEi21 IVEj12	19 5 57 5 6 6	IVE11	100	Dickinson	Sloping to moderately steep 5-14%		Erosion and moderately low moisture holding capacity
16	Deep, moderately coarse to coarse textured upland soils and medium textured soils, shallow to sand and gravel.	IIIEj12 IIISj11 IVSk11 IVEj11 IIISj12	21 64 8	IIIS34 IIIS36 IIIE34 IIIE36 IIIE37	7 33 20 20 7	Dickinson	Nearly level to sloping 2-4%	Sandy loam	Erosion and low moisture holding capacity

Appendix B-1 (Continued)

CODE	DESCRIPTION	IOWA LCU	IOWA DISTRIBUTION (%)	MINNESOTA LCU	MINNESOTA DISTRIBUTION (%)	MAJOR SOILS	SLOPE	TEXTURE CLASS	PROBLEMS
18	Poorly drained, medium to moderately fine textured bottomland soils. Moderately to moderately slowly permeable. May be subject to overflow.	IIWm21 IIWm22	94 6			Colo	Level to nearly level 0-2%	Silty clay loam and loam	Poorly drained and overflow
	Somewhat poorly to poorly drained fine textured soils of the bottom lands. Slowly to very slowly permeable. Subject to occasional overflow.	IIIWn21	100			Zook Wabash	Level to nearly level 0-2%	Silty clay	Poorly drained and overflow
20	Poorly drained, medium to moderately fine textured soils of uplands or lacustrine plains. Moderately slowly permeable. (Includes moderately deep soils over bedrock and/or gravel). May be seepy. Includes some calcareous soils.	IIWm31 IIWm32 IIWm33 IIWm41 IIIWn41 IIWn31	71 23 5	IIW02 IIW03 IIW08 IIW09 IIIW22	 84 12	Tainter Clyde Tripoli			
21	Somewhat poorly drained, moderately fine textured upland soils with firm to very firm, slowly permeable subsoils.	IIWm61	100	IIIW14	100		Level to gently sloping 0-3%	Loam	Wetness
22	Organic upland and depression soils. Agricultural soils when drained.	IIIWn51	100	IIIW38 IIIW39	 58 41		Level 0-2%	Muck	Wetness

Appendix B-1 (Continued)

CODE	DESCRIPTION	IOWA LCU	IOWA DISTRIBUTION (%)	MINNESOTA LCU	MINNESOTA DISTRIBUTION (%)	MAJOR SOILS	SLOPE	TEXTURE CLASS	PROBLEMS
23	Alluvial bottomland and organic soils subject to variable frequency of overflow and wetness.	IIIWn61	7			Colo-Zook	Level 0-2%	Mixed alluvial soils	Wetness overflow
		VWp11	92						
25	Coarse textured riverwash, subject to frequent flooding, and rough stony bottomland.	VIISr11	38			Riverwash Strongland Rough broken land	Level to undulating 0-4%		Wetness flooding and low moisture holding capacity
		VIISr12	56						
		VIIEs11	6						
28	Moderately coarse to fine textured upland soils. Included are soils which are moderately deep or deep to bedrock or sand and gravel.	VIEc11	12	VIE04	100	Downs Racine Clinton Fayette Lindley Keswick	Hilly to steep > 14%	Silt loam and loam	Erosion and low moisture holding capacity
		VIEc14	26						
		VIEc16							
		VIEd11							
		VIEd12	6						
		VIEd21	6						
		VIEe21	6						
		VIEe22							
		VIEi11							
		VIEi21							
		VIEj11							
		VIEj12							
		VIIEa41							
		VIIEc11							
		VIIEc13							
		VIIEc14							
		VIIEc16							
		VIIEd12	20						

Sheet 6 of 7

Appendix B-1 (Continued)

CODE	DESCRIPTION	IOWA		MINNESOTA		MAJOR SOILS	SLOPE	TEXTURE CLASS	PROBLEMS
		LCU	DISTRIBUTION (%)	LCU	DISTRIBUTION (%)				
28	(continued)	VIIEe22 VIIEj11 VIIEj12 VIIEe21 VIIEf11 VIIEd21	 5 6						
29	Well to excessively drained coarse textured and shallow soils of the uplands.	VIISk12 VIISh11 VISh11 VISk12	26 32 35			Rockton Dodgeville Sogn	Sloping to steep 9-24%		Erosion and low moisture holding capacity

Source: Conservation Needs Inventory.

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APPENDIX B-2

ESTIMATED SOIL EROSION BY SOIL RESOURCE GROUP (SRG) FOR BASE PERIOD, 2000 and 2020

Iowa-Cedar Rivers Basin

	Current Normal (1967-69)		2000		2020	
SRG	Acreage Cropped	Soil Erosion tons/acre	Acreage Cropped	Soil Erosion tons/acre	Acreage Cropped	Soil Erosion tons/acre
1	22,546	0	16,883	0	20,753	0
2	2,255,802	8.7	2,376,272	10.4	2,260,643	11.0
3	899,856	30.0	642,889	32.4	829,010	39.4
4	62,466	63.2	37,339	83.2	27,500	98.7
5	61,936	7.8	40,138	10.1	40,996	13.1
6	14,188	34.5	9,325	41.7	7,464	46.4
9	1,335	26.3	847	37.1	667	44.3
10	106,468	6.7	75,256	7.7	79,776	8.2
11	801	21.2	671	21.2	643	21.2
12	5,786	28.1	2,980	44.2	1,893	60.3
13	34,312	12.3	21,075	14.7	15,462	16.3
14	163,336	4.3	107,319	5.3	140,007	4.8
15	79,562	25.2	54,331	29.1	44,548	31.5
16	35,027	6.7	24,836	7.6	21,019	8.1
17	0	0	0	0	0	0
18	318,470	0	207,778	0	251,004	0
19	10,030	0	6,677	0	5,350	0
20	921,640	0	886,985	0	797,505	0
21	32,493	0	20,287	0	21,441	0
22	57,596	0	43,324	0	44,868	0
23	11,577	0	8,164	0	6,090	0
28	0	0	0	0	0	0
29	0	0	0	0	0	0
Total	5,095,225	11.0	4,583,374	11.5	4,616,638	13.9

POPULATION TRENDS BY COUNTY, 1950-1970

Iowa-Cedar Rivers Basin Economic Area

County	1950	Natural Increase 1950-60	Net Migration 1950-60	Net Change 1950-60	1960	Natural Increase 1960-70	Net Migration 1960-70	Net Change 1960-70	1970	Net Change 1950-70
Benton	22,656	2,628	-1,862	766	23,422	1,571	-2,108	-537	22,885	229
Black Hawk	100,448	20,164	1,870	22,034	122,482	17,783	-7,349	10,434	132,916	32,468
Bremer	18,884	2,734	-510	2,224	21,108	2,136	-507	1,629	22,737	3,853
Butler	17,394	1,947	-1,874	73	17,467	1,110	-1,624	-514	16,953	-441
Cedar	16,910	1,833	-952	881	17,791	1,127	-1,263	-136	17,655	745
Cerro Gordo	46,053	6,876	-3,035	3,841	49,894	3,520	-4,191	-671	49,223	3,170
Des Moines	42,056	4,790	-2,241	2,549	44,605	3,983	-1,606	2,377	46,982	4,926
Floyd	21,505	2,903	-3,303	-403	21,102	1,944	-3,186	-1,242	19,860	-1,645
Franklin	16,268	1,762	-2,558	-796	15,472	769	-2,986	-2,217	13,255	-3,013
Grundy	13,722	1,729	-1,319	410	14,132	990	-1,003	-13	14,119	397
Hancock	15,077	2,215	-2,688	-473	14,604	1,298	-2,410	-1,112	13,492	-1,585
Hardin	22,218	2,123	-1,808	315	22,533	909	-1,194	-285	22,248	30
Iowa	15,835	1,863	-1,302	561	16,396	1,040	-2,017	-977	15,419	-416
Johnson	45,756	9,489	-1,582	7,907	53,663	10,522	7,942	18,464	72,127	26,371
Linn	104,274	18,117	14,508	32,625	136,899	22,070	4,244	26,314	163,213	58,939
Louisa	11,101	896	-1,707	-811	10,290	598	-206	392	10,682	-419
Marshall	35,611	4,314	-1,941	2,373	37,984	2,902	190	3,092	41,076	5,465
Mitchell	13,945	2,203	-2,105	98	14,043	1,143	-2,078	-935	13,108	-837
Muscatine	32,148	3,604	-1,912	1,692	33,840	3,070	271	3,341	37,181	5,033
Poweshiek	19,344	2,065	-2,109	-44	19,300	1,182	-1,679	-497	18,803	-541
Tama	21,688	2,262	-2,537	-275	21,413	1,004	-2,270	-1,266	20,147	-1,541
Winnebago	13,450	1,599	-1,950	-351	13,099	651	-760	-109	12,990	-460
Worth	11,068	1,034	-1,843	-809	10,259	227	-1,518	-1,291	8,968	-2,100
State (Ia.)	677,411	99,150	-24,760	74,387	751,798	81,549	-27,308	54,241	806,039	129,628
Freeborn	34,517	5,847	-2,473	3,374	37,891	3,773	-3,600	173	38,064	3,547
Mower	42,277	8,782	-2,561	6,221	48,498	4,500	-9,215	-4,715	43,783	1,506
State (Minn.)	76,794	14,629	-5,034	9,595	86,389	8,273	-12,815	-4,542	81,039	4,053
Total	754,205	113,779	-29,794	83,982	838,187	89,822	-40,123	49,699	887,886	133,681

Source: U.S. Bureau of Census, 1950, 1960, 1970. County and City Data Book, 1967, 1972.

APPENDIX B-4

EMPLOYMENT BY INDUSTRIAL AND BUSINESS GROUPING, 1960 and 1970
Iowa-Cedar Rivers Basin Economic Area

Employment Groupings	Number Employed *	1960 Distribution Percent	Percent Change 1950-1960	Number Employed **	1970 Distribution Percent	Percent Change 1960-1970
Manufacturing	74,894	24	26	88,033	25	18
Wholesale and Retail Trade	59,449	19	-6	72,522	21	22
Transportation and Utilities	17,297	6	8	16,953	5	-2
Construction	15,428	5	-2	16,595	5	8
Finance, Insurance, and Real Estate	8,978	3	37	12,233	3	36
Public Administration	8,222	3	-	10,041	3	22
Education	21,661	7	-	34,580	10	60
Agriculture	57,707	18	-24	38,167	10	-34
Other Kinds of Work	50,549	16	29	61,927	18	22
Total Persons Employed	314,185	100	7	351,051	100	12

* Source: County and City Data Book, 1962.

** Source: U.S. Department of Commerce, Bureau of Census, Census of Population, 1970.

APPENDIX B-5

MANUFACTURING FIRMS, 1958-67

Iowa-Cedar Rivers Basin Economic Area

	1958		1963			1967		
	Firms Number	Distribution Percent	Firms Number	Distribution Percent	Percent Change 1958-63	Firms Number	Distribution Percent	Percent Change 1963-67
Food and Kindred Products	357	32	300	27	-16	235	22	-22
Lumber and Wood	58	5	61	5	+5	57	5	-7
Furniture and Fixtures	24	2	21	2	-12	21	2	0
Printing and Publishing	180	16	181	16	+1	192	18	+6
Stone, Clay, and Glass Products	93	9	100	9	+7	97	9	-3
Primary Metal, Fabricated Metal	99	9	99	9	0	91	9	-8
Machinery Manufacturers	117	11	139	13	+20	172	16	+24
Electrical Equipment	25	2	25	2	0	27	2	+8
Chemical Products	34	3	40	4	+18	35	3	-12
Other	125	11	143	13	+16	150	14	+5
Total	1,112	100	1,109	100	--	1,077	100	-3

Source: Census of Manufacturers, 1958, 1963, 1967.

APPENDIX B-6

MANUFACTURING FIRMS, 1973, IOWA PORTION ONLY

Iowa-Cedar Rivers Basin Economic Area

	Firms Number	Distribution Percent
Food and Kindred Products	222	18
Lumber and Wood	59	5
Furniture and Fixtures	26	2
Printing and Publishing	158	13
Stone, Clay, and Glass Products	107	8
Primary Metal, Fabricated Metal	146	12
Machinery Manufacturers	173	14
Electrical Equipment	26	2
Chemical Products	113	9
Other	207	17
Total	1,237	100

Source: Iowa Development Commission - Iowa Manufacturers, 1973-74.

APPENDIX B-7

MANUFACTURING

Iowa-Cedar Rivers Basin Economic Area

County	Value Added by Manufacture 1958 ($1,000)	1963 ($1,000)	1967 (million)
Benton	1,987	543	4.1
Black Hawk	168,836	224,197	311.6
Bremer	5,067	7,831	D
Butler	408	478	0.3
Cedar	1,138	1,312	4.0
Cerro Gordo	41,109	44,512	51.8
Des Moines	56,479	100,354	189.1
Floyd	21,995	D	D
Franklin	2,719	3,412	4.7
Grundy	1,457	3,086	4.6
Hancock	1,258	1,061	2.2
Hardin	7,986	8,073	13.7
Iowa	8,936	D	D
Johnson	25,335	57,679	102.5
Linn	213,306	321,987	421.8
Louisa	361	D	D
Marshall	50,401	73,765	85.7
Mitchell	547	483	0.7
Muscatine	24,003	40,370	84.4
Poweshiek	2,654	2,833	6.3
Tama	3,426	2,436	4.4
Winnebago	420	6,243	15.8
Worth	389	195	0.4
Freeborn	27,940	35,512	49.8
Mower	58,384	D	D
Total	726,541	936,362	1,357.9

Source: Census of Manufacturers, 1958, 1963, 1967.

D - Withheld to avoid disclosing figures for individual companies.

APPENDIX B-8

RETAIL ESTABLISHMENTS, 1958-67

Iowa-Cedar Rivers Basin Economic Area

Type	1958 Firms Number	1958 Distribution Percent	1963 Firms Number	1963 Distribution Percent	Percent Change 1958-63	1967 Firms Number	1967 Distribution Percent	Percent Change 1963-67
Building Materials, Hardware and Farm Implements	1,147	13	960	11	-16	896	10	-7
General Merchandise	322	3	315	4	0	403	5	28
Food Items	1,343	15	1,147	13	-14	1,019	12	-11
Automobile Dealers	543	6	552	6	4	550	6	0
Service Stations	1,269	14	1,236	14	-2	1,234	14	0
Apparel and Accessories Stores	494	5	486	6	-3	451	5	-7
Home Furnishing and Equipment	604	7	480	6	-20	542	6	13
Eating and Drinking	1,780	19	1,625	20	-3	1,736	20	2
Drugstores	251	3	250	3	0	226	3	12
Other Retail	1,774	15	2,002	17	9	2,171	19	12
Total	9,527	100	9,053	100	-5	9,228	100	2

Source: Census of Business, 1958, 1963, 1967.

APPENDIX B-9

RETAIL SALES BY INDUSTRY OR BUSINESS GROUP, 1958-67

Iowa-Cedar Rivers Basin Economic Area

Type	1958		1963			1967		
	Sales Million	Distribution Percent	Sales Million	Distribution Percent	Percent Change 1958-63	Sales Million	Distribution Percent	Percent Change 1963-67
Building Materials, Hardware and Farm Implements	$163.5	16	$147.0	12	-10	$200.4	13	36
General Merchandise	84.6	8	118.7	10	40	178.8	11	51
Food Stores	222.3	22	238.0	20	7	291.3	19	22
Automobile Dealers	169.8	16	207.0	18	22	252.6	16	22
Service Stations	80.9	8	97.8	8	21	122.1	8	25
Apparel and Accessories	54.9	5	49.4	4	-10	53.5	3	8
Home Furnishings and Equipment	50.0	5	49.2	4	-2	71.1	5	45
Eating and Drinking	61.0	6	70.2	6	15	96.9	6	38
Drugstores	28.7	3	35.7	3	24	46.7	3	31
Other Retail	130.4	11	191.5	15	47	271.9	16	42
Total	$1,053.6	100	$1,209.1	100	15	$1,588.2	100	31

Source: Census of Business, 1958, 1963, 1967.

APPENDIX B-10

GROWTH IN SELECTED SERVICES FIRMS, 1963-67

Iowa-Cedar Rivers Basin Economic Area

	Selected Services				
	1963		1967		
Service	Firms Number	Distribution Percent	Firms Number	Distribution Percent	Change Percent
1. Hotels, Motels, Tourist Courts, and Camps	316	6	360	6	14
2. Personal Services	2,173	43	2,461	43	13
3. Misc. Business Services	432	9	848	15	96
4. Auto Repair and Service Garages	739	15	694	12	-6
5. Misc. Repair Service	901	18	831	15	-8
6. Motion Picture	69	1	75	1	8
7. Other Amusement and Recreation	390	8	459	8	18
Total	5,020	100	5,728	100	14

Source: Census of Business, 1963, 1967.

APPENDIX B-11

NUMBER OF FARMS BY TYPE AND ECONOMIC CLASS, 1950-1969

Iowa-Cedar Rivers Basin Economic Area

	1950		1954		1959		1964		1969	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total Number of Farms	52,888	100	51,086	100	46,739	100	41,198	00	37,156	100
Cash Grain	5,758	11	10,350	20	8,400	18	9,622	23	9,487 *	
Other Field Crops	84	**	97	**	68	**	56	**	54 *	
Vegetable Farms	219	**	128	**	75	**	71	**	66 *	
Fruit and Nut	25	**	5	5	15	**	15	**	14 *	
Dairy	2,171	4	2,352	5	3,319	7	3,952	10	2,762 *	
Poultry	1,219	2	1,116	2	587	1	567	1	320 *	
Other Livestock	30,498	58	26,692	52	24,176	52	18,408	45	18,320 *	
General	8,977	17	6,615	13	4,849	10	4,149	10	1,635 *	
Other	3,937	7	3,731	7	5,250	11	4,358	11	136 *	
Commercial Farms-Total	49,142	93	47,441	93	41,579	89	37,037	90	33,585	90
Class I	1,993	4	3,030	6	2,198	5	2,777	7	5,996	16
Class II	12,646	24	15,059	29	6,423	14	7,893	19	9,399	25
Class III	18,774	35	16,422	32	13,572	29	12,879	31	8,662	23
Class IV	9,984	19	8,140	16	12,535	27	8,548	21	5,606	15
Class V	4,171	8	3,360	7	5,746	12	3,986	10	3,131	9
Class VI	1,574	3	1,430	3	1,105	2	954	2	791	2
Noncommercial Farms-Total	3,746	7	3,645	7	5,160	11	4,161	10	3,571	10
Part-Time	1,916	4	1,890	4	3,255	7	2,535	6	2,856	8
Part-Retirement	1,818	3	1,735	3	1,890	4	1,609	4	700	2
Abnormal	12	**	20	**	15	**	17	**	15	**

Source: U.S. Department of Commerce, Bureau of Census, Agriculture Census of 1950, 1954, 1959, 1964, 1969.

* Class I-V farms only.

** Less than 0.5 percent.

APPENDIX B-12

VALUE OF FARM PRODUCTS SOLD, 1950-1969

Iowa-Cedar Rivers Basin Economic Area

Item	1950	1954	1959	1964	1969 *
			(dollars)		
Field Crops (not vegetables, fruit, and nuts)	79,884,558	119,928,033	139,410,246	192,132,061	240,104,520
Vegetable Crops	3,285,213	2,928,781	2,411,021	2,486,936	2,744,081
Fruit & Nut Crops	249,752	113,082	250,230	165,082	189,442
Forest & Horticulture Specialty Crops	2,074,508	2,966,371	3,592,925	3,378,120	3,226,661
Total Crops	85,494,031	125,936,267	145,664,422	198,162,199	246,264,704
Livestock & Livestock Products - Not Poultry or Dairy	287,406,993	319,665,258	416,815,565	405,677,043	587,291,649
Dairy Products	37,058,159	36,872,652	43,539,756	55,363,953	51,931,963
Poultry & Poultry Products	37,255,078	31,526,602	31,383,119	31,166,992	24,381,562
Total Livestock	361,720,230	388,064,512	491,738,440	492,207,988	663,605,174
Total Crops & Livestock	447,214,261	514,000,779	637,402,862	690,370,187	909,869,878

Source: U.S. Department of Commerce, Bureau of Census, Agricultural Census, 1950, 1954, 1959, 1964, 1969.

* Class I-V farms only.

APPENDIX B-13

FERTILIZER AND LIME USED ON FARMS, 1954-1960

Iowa-Cedar Rivers Basin Economic Area

	1954	1959	1964	1969*
Fertilizer				
Number of Farms	32,384	30,973	32,416	25,503
Amount in Tons	187,536	228,410	377,306	460,010
Area Applied in Acres	2,129,420	2,594,314	2,733,906	2,727,371
Fertilizer by Crops				
Corn				
Amount in Acres	1,590,169	2,345,556	2,389,559	2,232,853
Amount in Tons	131,214	202,877	260,008	406,944
Soybeans				
Amount in Acres	N.A.	22,464	60,610	220,681
Amount in Tons	N.A.	1,854	5,019	18,376
All Crops				
Amount in Acres	2,129,420	2,594,314	2,733,906	2,727,371
Amount in Tons	187,536	228,410	377,306	460,010
Lime				
Number of Farms	10,572	5,451	7,387	5,662
Total Amount in Tons	579,507	358,377	574,880	589,274
Area Applied in Acres	254,809	154,180	246,978	238,972
Agricultural Chemicals				
Control of Crop Insects (acres)	**	**	557,559	1,103,928
Control of Weeds, Grass, and Brush (acres)	**	**	1,474,251	2,274,697

Source: U.S. Department of Commerce, Bureau of Census, Agriculture Census, 1954, 1959, 1964, and 1969.

* Class I-V farms only.

** Not available.

APPENDIX B-14

CURRENT LAND USE AND PRODUCTION

Iowa-Cedar Rivers Basin

Item	Acres	Yield	Production
			(000)
Corn	2,699,071	98.6 Bu.	266,128
Oats	509,505	56.1 Bu.	29,620
Soybeans	1,369,980	32.0 Bu.	43,839
Alfalfa	541,925	3.4 Tons	1,843
Other Hay	28,971	2.0 Tons	58
Corn Silage	82,781	15.7 Tons	1,300
Cropland Pasture	453,073	151.4 AD**	68,595
Other Crops*	18,480		
Idle	864,485		
Total Cropland	6,568,270		
Improved Pasture	270,154	122.6 AD	33,121
Other Pasture	399,046	86.2 AD	34,398
Total Pasture	669,200		
Grazed Forest	185,904***	65.0 AD****	12,084
Ungrazed Forest	123,936		
Total Forest	309,840		
Other Agricultural Land	256,270		
Total Agricultural Land	7,803,580		

Source: USDA Conservation Needs Inventory; U.S. Department of Commerce, Bureau of Census, Agriculture Census; Statistical Reporting Service.

* Other crops are assumed to be 3.4 percent of the oats acreage and would include wheat, barley, sorghums, vegetables, etc.

** AD = Animal day of grazing.

*** Sixty percent of the forest was estimated to be grazed.

**** The yield was assumed to be 75 percent of unimproved pasture.

APPENDIX B-15

CURRENT NORMAL AND PROJECTED YIELDS BY SOIL RESOURCE GROUP *

Iowa-Cedar Rivers Basin

	Corn (bu)	Corn Silage (ton)	Oats (bu)	Soy-beans (bu)	Crop Pasture (day)	Alfalfa Hay (ton)	Other Hay (ton)	Improved Pasture (day)	Pasture (day)
SRG 1									
1967-69	104.0	16.4	41.0	35.3	166.5	3.7	2.1	130.5	94.5
1980	137.3	22.6	54.5	44.1	218.1	4.8	2.8	171.0	123.8
2000	163.3	26.9	66.0	50.5	249.7	5.5	3.1	195.7	141.7
2020	187.2	29.8	76.3	55.4	288.0	6.4	3.6	225.8	163.5
SRG 2									
1967-69	114.0	17.8	63.0	35.3	166.5	3.7	2.3	135.0	103.5
1980	150.5	24.6	83.8	44.1	218.1	4.8	3.0	176.8	135.6
2000	179.0	29.2	101.4	50.5	249.7	5.5	3.4	202.5	155.2
2020	205.2	32.4	117.2	55.4	288.0	6.4	4.0	233.5	179.1
SRG 3									
1967-69	94.0	15.0	58.0	32.8	157.5	3.5	1.9	121.5	85.5
1980	124.1	20.7	77.1	41.0	206.3	4.6	2.5	159.2	112.0
2000	147.6	24.6	93.4	46.9	236.2	5.3	2.8	182.2	128.2
2020	169.2	27.3	107.9	51.5	272.5	6.1	3.3	210.2	147.9
SRG 4									
1967-69	73.0	11.4	48.0	27.1	126.0	2.8	1.5	96.7	57.5
1980	96.4	15.7	63.8	33.9	165.1	3.7	2.0	126.7	88.4
2000	114.6	18.7	77.3	38.8	189.0	4.2	2.3	145.1	101.2
2020	131.4	20.7	89.3	42.5	218.0	4.8	2.6	167.4	116.8

	Corn (bu)	Corn Silage (ton)	Oats (bu)	Soy-beans (bu)	Crop Pasture (day)	Alfalfa Hay (ton)	Other Hay (ton)	Improved Pasture (day)	Pasture (day)
SRG 5									
1967-69	98.0	15.7	48.8	27.1	130.5	2.9	2.0	110.2	98.0
1980	129.4	21.7	63.8	33.9	171.0	3.8	2.6	144.4	117.9
2000	153.9	25.7	77.3	38.8	195.7	4.3	3.0	165.4	135.0
2020	176.4	28.6	89.3	42.5	225.8	5.0	3.5	190.7	155.7
SRG 6									
1967-69	73.0	11.4	43.0	24.6	117.0	2.6	1.5	92.2	67.5
1980	96.4	15.7	57.2	30.7	153.3	3.4	2.0	120.8	88.4
2000	114.6	18.7	69.2	35.2	175.5	3.9	2.3	138.4	101.2
2020	131.4	20.7	80.0	38.6	202.4	4.5	2.6	159.6	116.8
SRG 9									
1967-69	64.0	10.0	39.0	21.3	108.0	2.4	1.3	83.2	58.5
1980	84.5	13.8	51.9	26.6	141.5	3.1	1.7	109.1	76.6
2000	100.5	16.4	62.8	30.5	162.0	3.6	1.9	124.9	87.7
2020	115.2	18.2	72.5	33.4	186.8	4.2	2.2	144.0	101.2
SRG 10									
1967-69	88.0	13.6	37.0	30.3	126.0	2.8	1.8	103.5	81.0
1980	116.2	18.8	49.2	37.9	165.1	3.7	2.4	135.6	105.1
2000	138.2	22.3	59.6	43.3	189.0	4.2	2.7	155.2	121.5
2020	158.4	24.8	68.8	47.6	218.0	4.8	3.1	179.1	140.1

Sheet 2 of 8

Appendix B-15 (continued)

	Corn (bu)	Corn Silage (ton)	Oats (bu)	Soy-beans (bu)	Crop Pasture (day)	Alfalfa Hay (day)	Other Hay (ton)	Improved Pasture (day)	Pasture (day)
SRG 10N									
1967-69	45.0	10.0	19.0	15.6	126.0	2.8	0.9		
1980	59.4	13.8	25.3	19.5	165.1	3.7	1.2		
2000	70.6	16.4	30.6	22.3	189.0	4.2	1.3		
2020	81.0	18.2	35.3	24.5	218.0	4.8	1.6		
SRG 11									
1967-69	59.0	9.3		20.5	94.5	2.1	1.2		
1980	77.9	12.0		25.6	123.8	2.8	1.6		
2000	92.6	15.3		29.3	141.7	3.1	1.8		
2020	106.2	16.9		32.2	163.5	3.6	2.1		
SRG 12									
1967-69	49.0	7.9	21.0		81.0	1.8	1.0	63.0	45.0
1980	64.7	10.9	27.9		106.1	2.4	1.3	82.5	59.0
2000	76.9	13.0	33.8		121.5	2.7	1.5	94.5	67.5
2020	88.2	14.4	39.1		140.1	3.1	1.7	109.0	77.8
SRG 13									
1967-69	41.0	6.4	21.0		54.0	1.2	0.8	45.0	36.0
1960	54.1	8.8	27.9		70.7	1.6	1.0	59.0	47.2
2000	64.4	10.5	33.8		81.0	1.8	1.2	67.5	54.0
2020	73.8	11.6	39.1		93.4	2.1	1.4	77.8	62.3

Sheet 3 of 8

Appendix B-15 (continued)

	Corn (bu)	Corn Silage (ton)	Oats (bu)	Soy-beans (bu)	Crop Pasture (day)	Alfalfa Hay (day)	Other Hay (ton)	Improved Pasture (day)	Pasture (day)
SRG 14									
1967-69	78.0	12.1	53.0	29.5	139.5	3.1	2.0	114.7	90.0
1980	103.0	16.7	70.5	36.9	182.7	4.1	2.6	150.3	117.9
2000	122.5	19.8	85.3	42.2	209.2	4.6	3.0	172.1	135.0
2020	140.4	22.0	98.6	46.3	241.3	5.4	3.5	198.5	155.7
SRG 15									
1967-69	68.0	10.7	48.0	27.1	130.5	2.9	1.4	96.7	63.0
1980	89.8	14.8	63.8	33.9	171.0	3.8	1.8	126.7	82.5
2000	106.8	17.5	77.3	38.8	195.7	4.3	2.1	145.1	94.5
2020	122.4	19.5	89.3	42.5	225.8	5.0	2.4	167.4	109.0
SRG 16									
1967-69	66.0	10.7	28.0	16.4	54.0	1.2	1.3	56.3	58.5
1980	87.1	14.8	37.2	20.5	70.7	1.6	1.7	73.7	76.6
2000	103.6	17.5	45.1	23.5	81.0	1.8	1.9	84.4	87.7
2020	118.8	19.5	52.1	25.7	93.4	2.1	2.2	97.3	101.2
SRG 18									
1967-69	95.0		54.0	32.8	148.5	3.3	2.3	126.0	103.5
1980	125.4		71.8	41.0	194.5	4.3	3.0	165.1	135.6
2000	149.1		86.9	46.9	222.7	4.9	3.4	189.0	155.2
2020	171.0		100.4	51.5	256.9	5.7	4.0	218.8	179.1

Sheet 4 of 8

	Corn (bu)	Corn Silage (ton)	Oats (bu)	Soy-beans (bu)	Crop Pasture (day)	Alfalfa Hay (day)	Other Hay (day)	Improved Pasture (day)	Pasture
SRG 18 PD									
1967-69	71.0	15.0	41.0	24.6	90.0	2.0	1.7		
1980	93.7	20.7	54.5	30.7	117.9	2.6	2.2		
2000	111.5	24.6	66.0	35.2	135.0	3.0	2.5		
2020	127.8	27.3	76.3	38.6	155.7	3.5	2.9		
SRG 18 ND									
1967-69	47.0	8.6	27.0	16.4	54.0	1.2	1.2		
1980	62.0	11.9	35.9	20.5	70.7	1.6	1.6		
2000	73.8	14.1	43.5	23.5	81.0	1.8	1.8		
2020	84.6	15.7	50.2	25.7	93.4	2.1	2.1		
SRG 19									
1967-69	77.0			28.7	130.5	2.9	1.6		
1980	101.6			35.9	171.0	3.8	2.1		
2000	120.9			41.0	195.7	4.3	2.4		
2020	138.6			45.1	225.8	5.0	2.8		
SRG 19 PD									
1967-69	59.0	12.1	24.0	20.5	90.0	2.0	2.1		
1980	77.9	16.7	31.9	25.6	117.9	2.6	2.8		
2000	92.6	19.8	38.6	29.3	135.0	3.0	3.1		
2020	106.2	22.0	44.6	32.2	155.7	3.5	3.6		

Sheet 5 of 8

Appendix B-15 (Con tinued)

	Corn (bu)	Corn Silage (ton)	Oats (bu)	Soy-beans (bu)	Crop Pasture (day)	Alfalfa Hay (day)	Other Hay (ton)	Improved Pasture (day)	Pasture (day)
SRG 19 ND									
1967-69	34.0		14.0	11.5	54.0	1.2	1.1		
1980	44.9		18.6	14.4	70.7	1.6	1.4		
2000	53.4		22.5	16.4	81.0	1.8	1.6		
2020	61.2		26.0	18.1	93.4	2.1	1.9		
SRG 20									
1967-69	114.0	17.8	65.0	38.5	175.5	3.9	2.3		
1980	150.5	24.6	86.4	48.1	229.9	5.1	3.0		
2000	179.0	29.2	104.6	55.1	263.2	5.8	3.4		
2020	205.2	32.4	120.9	60.4	303.6	6.7	4.0		
SRG 20 PD									
1967-69	86.0	12.1	48.0	28.7	155.0	3.0	2.2		
1980	113.5	16.7	63.8	35.9	175.8	3.9	2.9		
2000	135.0	18.8	77.3	41.0	202.5	4.5	3.3		
2020	154.8	22.0	89.3	45.1	233.5	5.2	3.8		
SRG 20 ND									
1967-69	57.0	10.7	32.0	19.7	90.0	2.0	1.5		
1980	75.2	14.8	42.6	24.6	117.9	2.6	2.0		
2000	89.5	17.5	51.5	28.2	135.0	3.0	2.3		
2020	102.6	19.5	59.5	30.9	155.7	3.5	2.6		

Appendix B-15 (continued)

	Corn (bu)	Corn Silage (ton)	Oats (bu)	Soy-beans (bu)	Crop Pasture (day)	Alfalfa Hay (day)	Other Hay (ton)	Improved Pasture (day)	Pasture (day)
SRG 21									
1967-69	89.0	14.3	48.0	27.1	130.5	2.9	1.8	105.7	81.0
1980	117.5	19.7	63.8	33.9	171.0	3.8	2.4	138.5	106.1
2000	130.7	23.5	77.3	38.8	195.7	4.3	2.7	158.6	121.5
2020	160.2	26.0	89.3	42.5	225.8	5.0	3.1	182.9	140.1
SRG 22									
1967-69	81.0	15.7	49.0	27.9	121.5	2.7	1.6		
1980	106.9	21.7	65.2	34.9	159.2	3.5	2.1		
2000	127.2	25.7	78.9	39.9	182.2	4.0	2.4		
2020	145.8	28.6	91.1	43.8	210.2	4.7	2.8		
SRG 22 PD									
1967-69	41.0			13.9	58.5	1.3	0.9		
1980	54.1			17.4	76.6	1.7	1.2		
2000	64.4			19.9	87.7	1.9	1.3		
2020	73.8			21.8	101.2	2.2	1.6		
SRG 23									
1967-69	67.0			23.0		2.7			72.0
1980	88.4			28.8		3.5			94.3
2000	105.2			32.9		4.0			108.0
2020	120.6			36.1		4.7			124.6

Sheet 7 of 8

	Corn (bu)	Corn Silage (ton)	Oats (bu)	Soy-beans (bu)	Crop Pasture (day)	Alfalfa Hay (day)	Other Hay (day)	Improved Pasture (day)	Pasture (day)
SRG 23 PD									
1967-69	41.0		26.0	13.9		1.7			
1980	54.1		34.6	17.4		2.2			
2000	64.4		41.9	19.9		2.5			
2020	73.8		48.4	21.8		2.9			
SRG 25									
1967-69									72.0
1980									94.3
2000									108.0
2020									124.6
SRG 28									
1967-69									72.0
1980									94.3
2000									108.0
2020									124.6
SRG 29									
1967-69									72.0
1980									94.3
2000									108.0
2020									124.6

* The relative productivity of each SRG was estimated so that the current ranking of yields among soils was maintained. These yields were then multiplied by the current normal land use to arrive at total production. The yields were then normalized so that the total production figures agreed with published SRS totals.

Sheet 8 of 8

APPENDIX B-16

CURRENT AND PROJECTED FEED UNIT REQUIREMENTS

Iowa-Cedar Rivers Basin

Item	Current*	1980	2000	2020
	(feed unit per pound live weight)			
Beef & Veal**	8.5	8.0	7.6	7.0
Pork	4.3	4.1	3.7	3.5
Lamb & Mutton	7.9	7.5	7.0	6.5
Turkeys	3.7	3.3	3.0	2.6
Broilers	2.4	2.1	1.9	1.8
Farm Chickens***	5.5	5.5	5.5	5.5
Milk	1.5	1.4	1.3	1.2
Eggs****	.53	.46	.42	.40

Source: Upper Mississippi River Comprehensive Basin Study

* 1959-62.

** Assumes 75 percent of the production from feedlots.

*** NIRAP projection.

**** Feed units per egg.

APPENDIX B-17

TOTAL FEED UNIT, ROUGHAGE, AND FEED GRAIN REQUIREMENTS

Iowa-Cedar Rivers Basin

	Current Normal	1980	2000	2020
		(million feed units)		
Total Feed Required				
Beef & Veal	5,236	6,400	6,840	7,350
Pork	5,259	6,560	7,252	8,260
Lamb & Mutton	190	128	154	170
Turkeys	159	280	330	377
Broilers	10	8	10	13
Farm Chickens	148	138	165	192
Milk	2,348	2,590	3,418	4,073
Eggs	790	615	680	770
Total	14,140	15,919	18,469	20,855
Roughage				
Beef & Veal	2,304	2,688	2,667	2,646
Pork	458	459	508	495
Lamb & Mutton	70	46	55	61
Turkeys				
Broilers				
Farm Chickens				
Milk	1,644	1,671	2,290	2,607
Eggs				
Total	4,476	4,954	5,520	5,809
Feed Grains				
Beef & Veal	2,775	3,584	4,172	4,550
Pork	4,339	5,510	6,237	7,186
Lamb & Mutton	108	73	88	97
Turkeys	111	199	241	279
Broilers	6	6	8	10
Farm Chickens	148	138	165	192
Milk	634	751	1,060	1,385
Eggs	632	523	612	693
Total	8,753	10,784	12,783	14,392

APPENDIX B-18

ROUGHAGE REQUIREMENT SUMMARY

Iowa-Cedar Rivers Basin

Item	1967-69	1980	2000	2020
		(thousand animal days)		
Permanent Grazing Lands				
Improved Pasture	33,121	43,387	49,681	57,300
Unimproved Pasture	34,398	45,052	51,597	59,498
Grazed Forest	12,084	10,534	9,109	5,205
Total AD's	69,603	98,973	110,387	122,003
		(million feed units)		
Total Roughage Required	4,476	4,954	5,520	5,809
Total Feed Units from Permanent Grazing Lands	1,194	1,484	1,655	1,830
Residual to be Supplied from Cropland	3,282	3,470	3,865	3,979
		(Index)		
Index of Roughage Required	100	106	118	121
Yield Index	100	130	150	173

APPENDIX B-19

MAJOR LAND USE IN ACRES BY SUBBASINS, YEAR 2000

Iowa-Cedar Rivers Basin

Subbasin	Cropland	Pasture	Forest	Other
Iowa				
North Half	728,943	58,232	19,821	21,281
South Half	1,661,631	222,072	121,349	59,427
Cedar				
Minnesota Portion	393,529	23,976	4,949	18,926
Iowa Portion				
North Half	598,218	57,172	25,357	21,548
South Half	1,661,082	156,382	92,212	72,037
Shell Rock				
Minnesota Portion	158,108	12,107	2,152	13,794
Iowa Portion	772,743	67,213	13,258	31,057
West Fork	456,501	47,761	7,992	13,142
Flint	137,520	24,290	22,751	5,056
Total	6,568,275	669,205	309,841	256,266
Percent of Land	84	9	4	3

APPENDIX B-20

CORN AND SOYBEAN ACREAGE BY SUBBASIN THROUGH TIME

Iowa-Cedar Rivers Basin

Subbasin	1967-69	1980	Percent Change*	2000	Percent Change*	2020	Percent Change*
Iowa							
North Half	541,661	543,246	1	546,417	1	569,512	5
South Half	890,887	883,456	-1	868,593	-2	985,438	11
Cedar							
Minnesota Portion	261,801	257,521	-2	248,960	-5	258,295	-1
Iowa Portion							
North Half	348,250	392,889	2	410,168	7	434,416	13
South Half	1,058,090	1,060,870	**	1,066,417	1	1,132,356	7
Shell Rock							
Minnesota Portion	118,501	117,951	**	116,839	-1	119,741	1
Iowa Portion	509,149	513,509	1	522,215	3	563,027	11
West Fork	303,757	302,327	**	299,454	-1	308,507	2
Flint	84,180	83,140	-1	81,061	-4	83,701	**
Total	4,152,276	4,154,909		4,160,124		4,454,993	

* Percent change from the base period 1967-69.

** Less than 0.5 percent.

APPENDIX C-1

Iowa-Cedar Rivers Basin

Fish and Wildlife

Wildlife populations have not been determined numerically. Iowa Conservation Commission and Minnesota Department of Natural Resources personnel utilize index methods of determining relative abundance of various wildlife species. Methods are variable but most frequently used are call counts or roadside sighting counts. The following maps illustrate wildlife populations using a high, moderate, low, or infrequent scale of occurrence.

Appendix C-1 (cont'd)

WILDLIFE DISTRIBUTION

Sheet 1 of 9

Appendix C-1 (cont'd)

WILDLIFE DISTRIBUTION

RED FOX

QUAIL

Sheet 2 of 9

Appendix C-1 (cont'd)

WILDLIFE DISTRIBUTION

LEGEND

Basin & Subbasin Boundaries

High Density

Low Density

Infrequent

DEER

COYOTE
OTTER
RUFFED GROUSE
TURKEY
WOODCHUCK

Sheet 3 of 9

Appendix C-1 (cont'd)

WILDLIFE DISTRIBUTION

LEGEND

BASIN & SUBBASIN BOUNDARIES

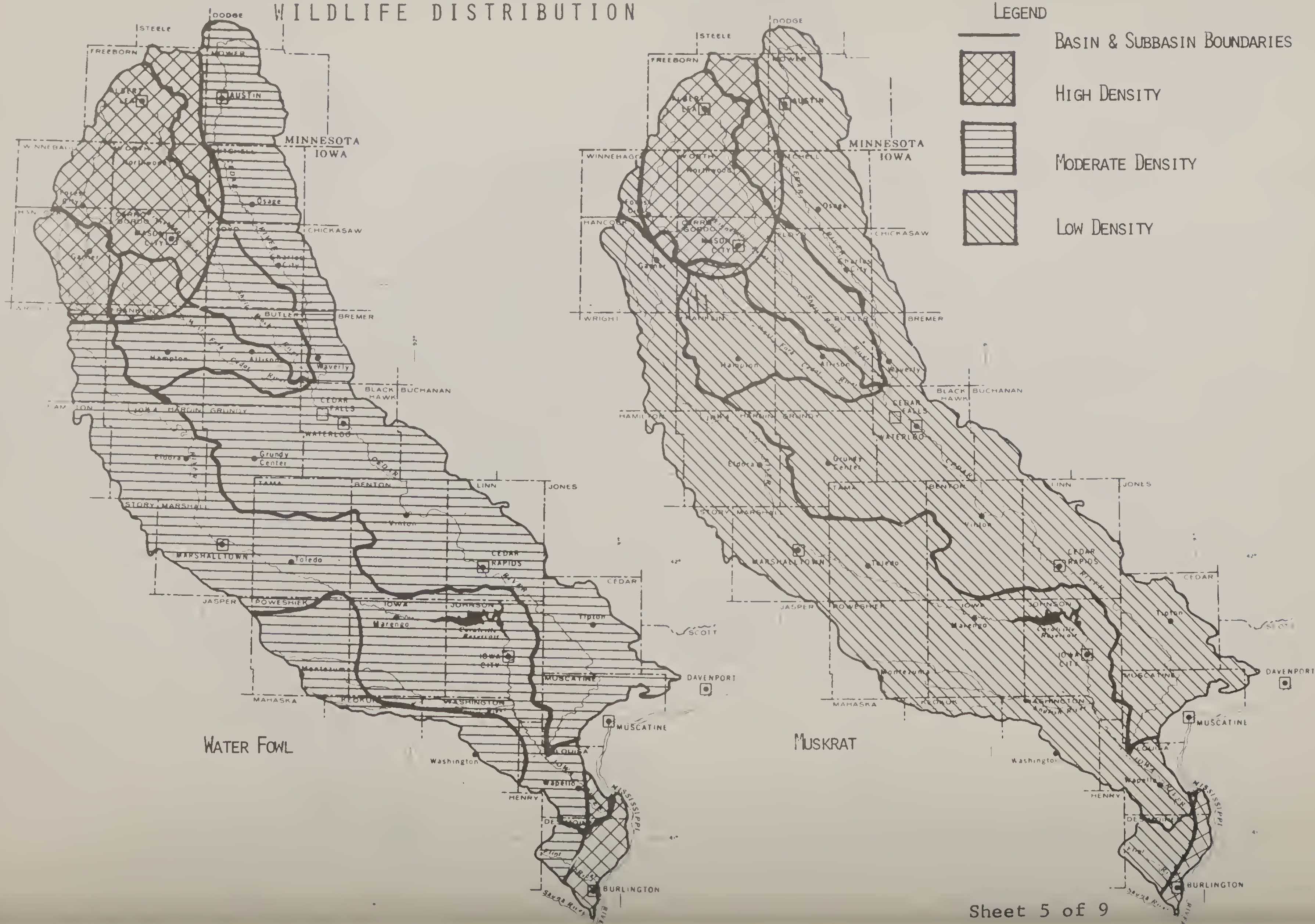
HIGH DENSITY

RACCOON
OPOSSUM
STRIPED SKUNK
BADGER

Sheet 4 of 9

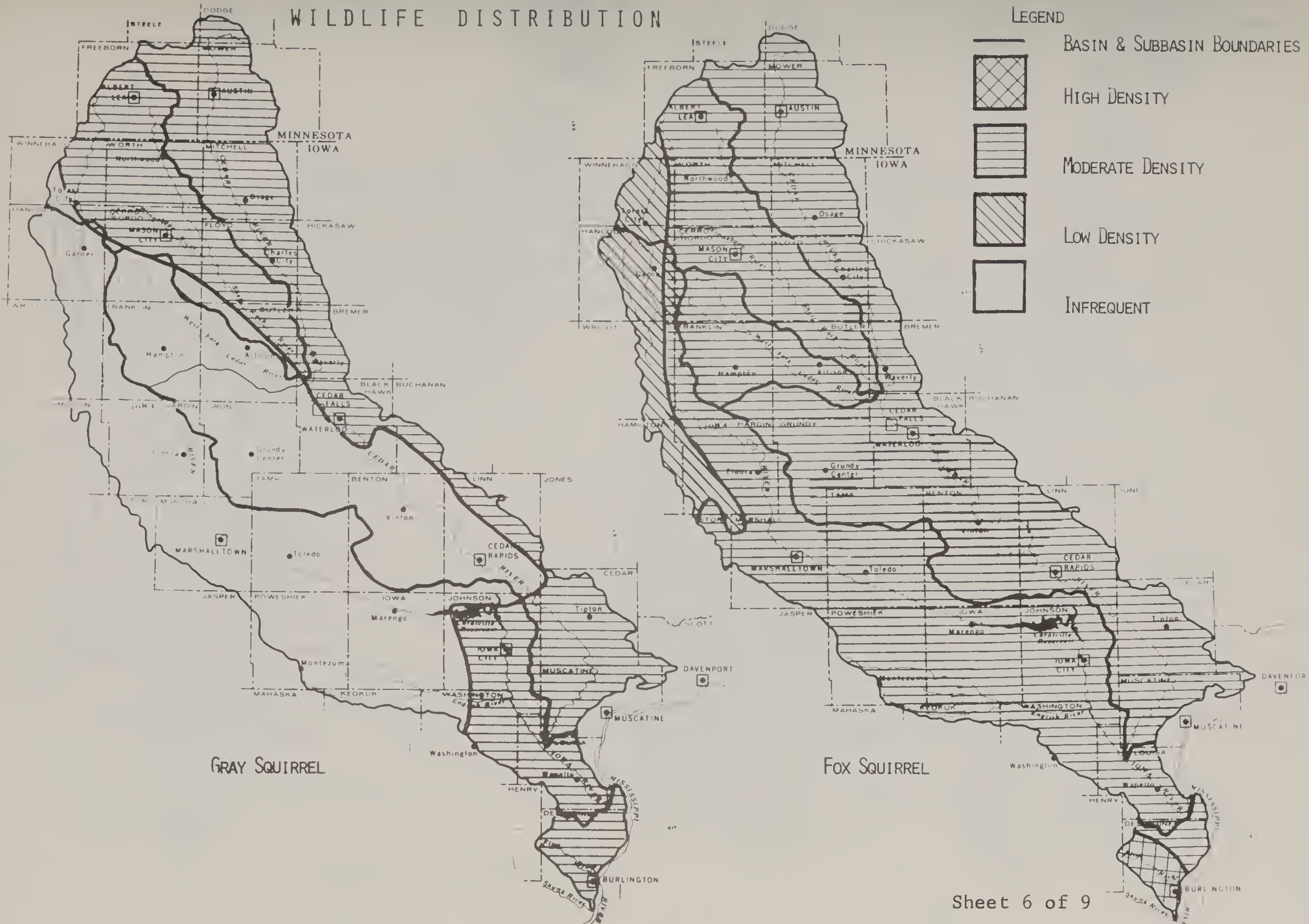
Appendix C-1 (cont'd)

WILDLIFE DISTRIBUTION



Appendix C-1 (cont'd)

WILDLIFE DISTRIBUTION



Sheet 6 of 9

Appendix C-1 (cont'd)

WILDLIFE DISTRIBUTION

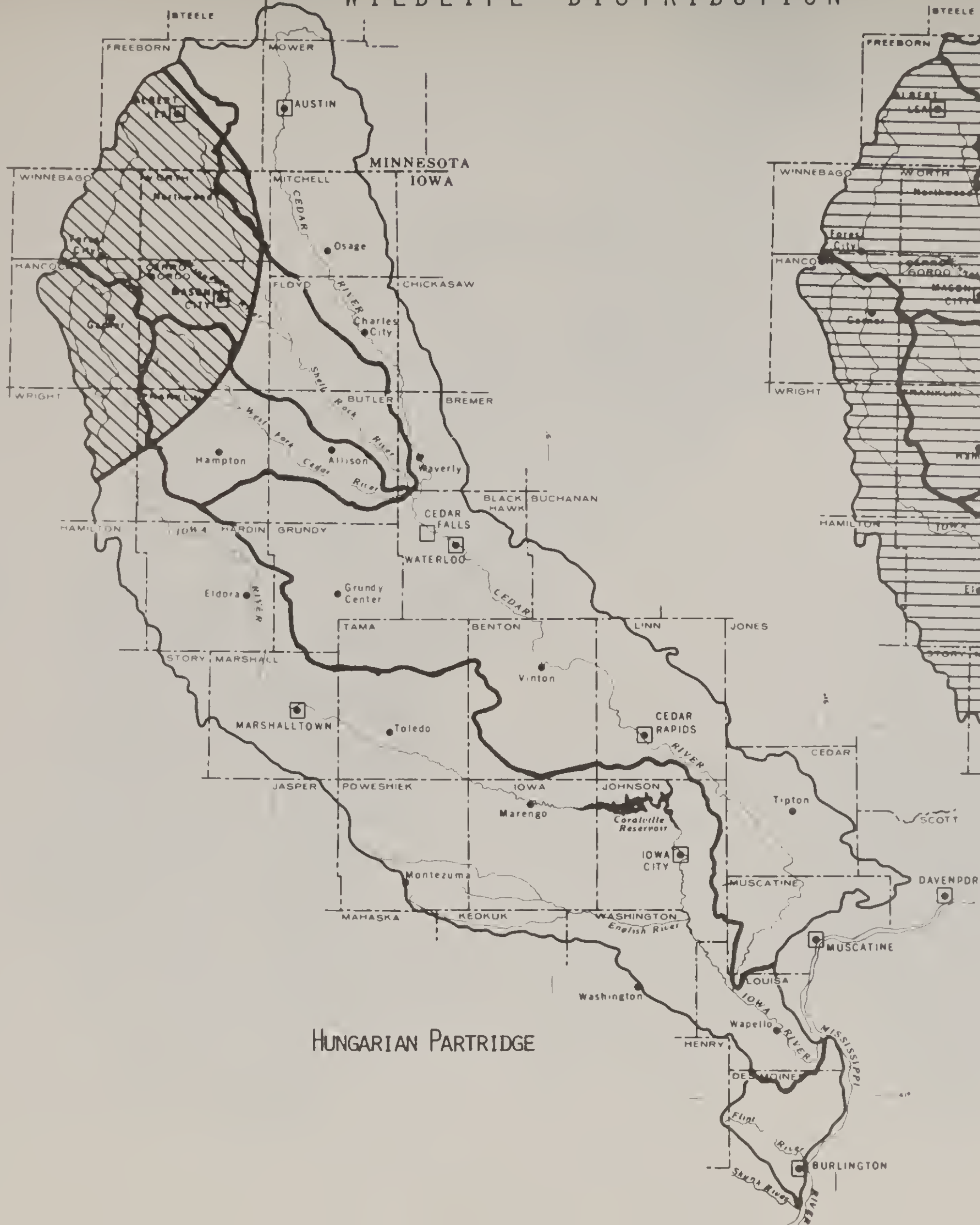
Sheet 7 of 9

Appendix C-1 (cont'd)

WILDLIFE DISTRIBUTION

LEGEND

- Basin & Subbasin Boundaries
- Moderate Density
- Low Density
- Infrequent



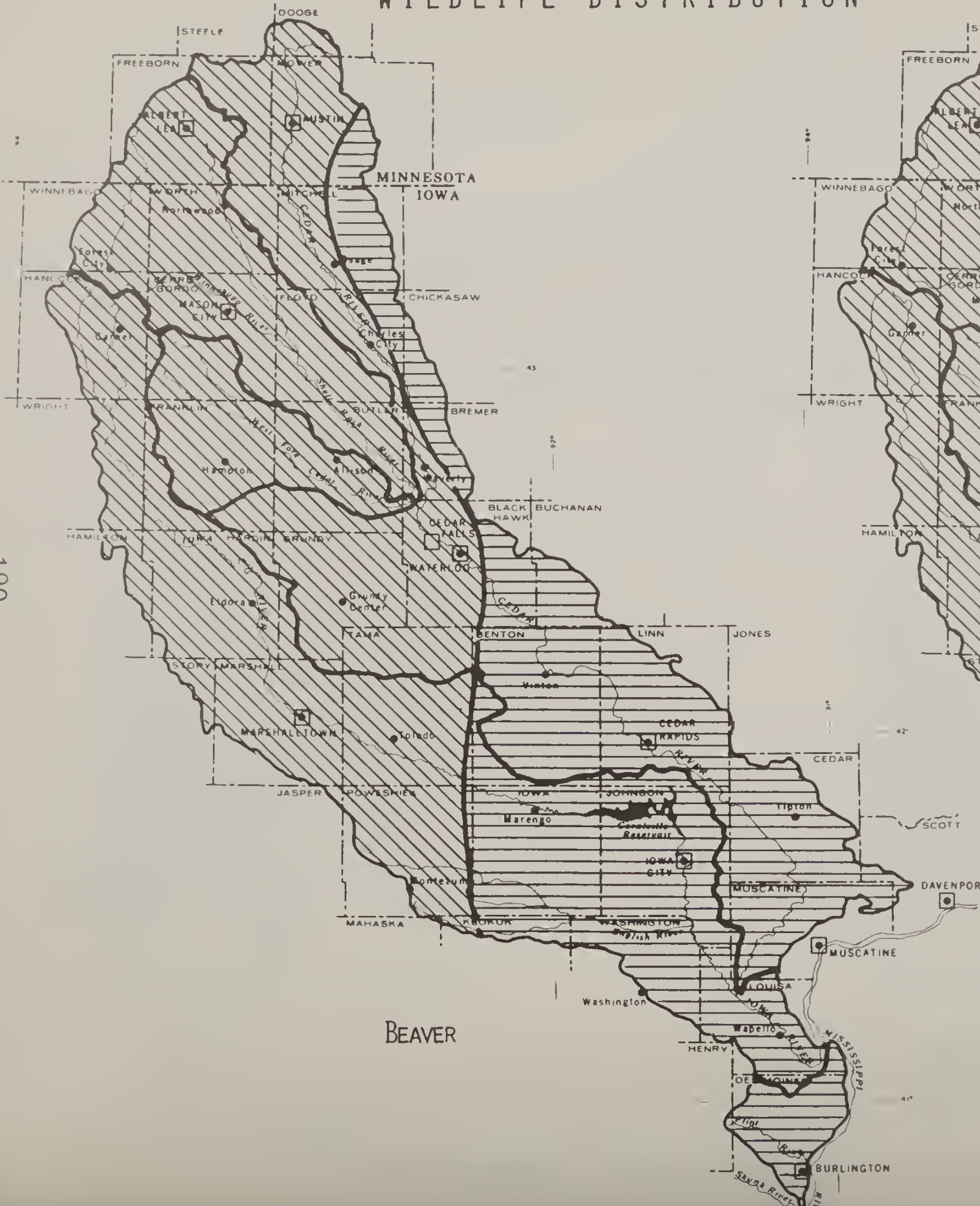
HUNGARIAN PARTRIDGE

JACKRABBIT

Sheet 8 of 9

Appendix C-1 (cont'd)

WILDLIFE DISTRIBUTION



Sheet 9 of 9

APPENDIX C-2

GAME ANIMALS, GAME BIRDS, AND FURBEARERS

Iowa-Cedar Rivers Basin

Common Name	Scientific Name
Whitetail Deer	Odocoileus virginianus
Whitetail Jackrabbit	Lepus townsendi
Eastern Cottontail Rabbit	Sylvilagus floridanus
Eastern Fox Squirrel	Sciurus niger
Eastern Gray Squirrel	Sciurus carolinensis
Red Fox	Vulpes fulva
Gray Fox	Urocyon cinereoargenteus
Raccoon	Procyon lotor
Opossum	Didelphis Marsupialis
Mink	Mustela vison
Short-tailed Weasel	Mustela erminea
Long-tailed Weasel	Mustela frenata
Least Weasel	Mustela rixosa
Striped Skunk	Mephitis mephitis
Spotted Skunk	Spilogale purorius
Beaver	Castor canadensis
Muskrat	Ondatra zibethica
Woodchuck	Marmota monax
Badger	Taxidea taxus
Coyote	Canis latrans
River Otter	Lutra canadensis
Hungarian Partridge	Perdix perdix
Ring-necked Pheasant	Phasianus colchicus
Bob-White Quail	Colinus virginianus
Mourning Dove	Zenaidura macroura
Wilson's Snipe	Capella gallinago
Ruffed Grouse	Bonasa umbellus
Turkey	Meleagris gallopavo
Woodcock	Philohela minor
King Rail	Rallus elegans
Virginia Rail	Rallus limicola
Sora Rail	Porzana Carolina
Canada Goose	Branta canadensis
Snow Goose	Chen hyperborea
Blue Goose	Chen caerulescens
White-Fronted Goose	Anser albifrons

Common Name	Scientific Name
Mallard Duck	Anas platyrhynchos
Black Duck	Anas rubripes
Gadwall Duck	Anas strepera
Pintail Duck	Anas acuta
Green-winged Teal Duck	Anas carolinensis
Blue-winged Teal Duck	Anas discors
American Widgeon (Baldpate) Duck	Mareca americana
Shoveller Duck	Spatula clypeata
Wood Duck	Aix sponsa
Redhead Duck	Aythya americana
Canvasback Duck	Aythya valisineria
Lesser Scaup Duck	Aythya affinis
Ring-necked Duck	Aythya collaris
Buffle-Head Duck	Gloucionetta albeola
Ruddy Duck	Erismatura jamaicensis
American Merganser Duck	Mergus merganser
Hooded Merganser Duck	Lophodytes cucullatus
Coot	Fulica americana
American Golden-Eye Duck	Glaucionetta clangula

APPENDIX C-3

WILDLIFE HABITAT INVENTORY

Iowa-Cedar Rivers Basin

The quality and quantity of wildlife habitat is important in determining the carrying capacity of any area. Data to evaluate the wildlife habitat quality and quantity was obtained by SCS District Conservationists from Conservation Needs Inventory 2% sample areas.

Seventeen land use categories were established. A series of management factors that affect habitat quality were also established to describe each land use (see example forms). For all 160 acre sample areas the acreage in each land use, further described by management system, was determined. Data was gathered so it could be sorted mechanically.

The sample acreage figures were expanded to a county basis for each land use and management system. Each factor in a management system was assigned a value from .1 to 1.0. By multiplying through the factors a quality rating, called the "percent of potential", was determined.

Inventory data of this type have not been taken before. Periodic inventories of this type could provide base-line information to compare future habitat studies. Habitat studies coupled with wildlife population inventories could be a valuable tool in the management of the total resource.

More detailed information is available from the SCS, Des Moines, Iowa.

INSTRUCTIONS FOR COMPLETION OF FORMS

1. Heading

   County - Will be number of your county as on license plates.

   SCD - Will be the same as used on 253's

   Sample Area - Will be number identifying each quarter-section. These are read as follows: Vertical columns first, horizontal column second, quarter-section number third. They are recorded with a zero before vertical and horizontal number, for example 01 02 3R

   Subbasin - This number is in blue on county map as well as subwatershed boundary lines. Quarter-section on a subwatershed boundary line has an arrow indicating subwatershed it is to be recorded in. Quarter sections outside of Iowa-Cedar River Basin are in red with identifying number also in red. Complete all CNI sample areas in your county.

2. Each land use will be inventoried separately using one line of the form. Use as many forms as you need.

3. Use only code numbers or letters listed on remainder of form.

4. Consider each field as one land use. Five corn fields would be recorded on five lines.

5. The amount column will be a number applying to the unit such as, acres of crop field or number of 100-foot stations of fence row. Your best estimate is sufficient. Photos may be used to estimate acreages and lengths. Report to the nearest acre and 100-foot station.

6. Dominant vegetation, grazing practice, ownership and land form columns will not apply to urban, transportation and farmstead land uses.

7. Description of land use section will be completed starting in left hand column. Each land use description may have none, one, two or three items describing it; fill in all that apply. Use only descriptions of land use that correspond with land use code.

8. State Conservation Commission wildlife management biologists should be contacted for assistance in completing this survey although they may not be available to help complete the entire survey.

9. An example of a completed form is attached

10. A glossary of terms is attached.

11. Please send the number of sportsmen clubs in your county with the acreage they lease, own or otherwise control for hunting regardless of the primary land use.

12. If you have any questions, call Lyle Asell, Biologist - (515) 284-4260.

DEFINITION OF TERMS

LAND USE

01 CROPLAND

Land used primarily for the production of adapted cultivated and close-growing crops for harvest, alone or in association with sod crops.

02 FARMSTEAD

Land used primarily for dwellings, barns, pens, corrals, gardens, small pastures, and other uses in connection with operating farms or ranches.

03 HAYLAND

Land used primarily for the production of hay from long-term stands of adapted forage plants.

04 GRASSLAND

Land used primarily for the production of adapted forage plants.

05 RECREATION LAND

Land and water used primarily for recreation

06 TRANSPORTATION SERVICES LAND

Land used primarily for highways, roads, beltways, railroads, utility rights-of-way, airports, and other transportation facilities, together with necessary adjacent facilities such as approaches, underground and surface utilities, and other servicing structures, appurtenances, and measures.

07 WOODLAND

Land used primarily for the production of adapted wood crops and to provide tree cover for watershed protection, beautification, etc. Does not include farmstead and field windbreak plantings.

08 URBAN LAND USED FOR ANY OF THE FOLLOWING:

Commercial Industrial Land - Land used primarily for buying, selling, and processing goods and services and including sites for stores, factories, shopping centers, and industrial parks, together with necessary adjacent facilities such as underground and surface utilities, access streets and alleys, and other servicing structures, appurtenances, and measures.

08 (continued)

Community Services Land - Land used primarily for schools, hospitals, churches, libraries, sewerage and water treatment plants, sanitary land fills, public parking areas, and other community service facilities, together with necessary adjacent facilities such as underground and surface utilities, access streets and alleys, and other servicing structures, appurtenances and measures.

Residential Land - Land used primarily for permanent dwellings, such as houses, partments, and housing developments, including adjacent facilities such as underground and surface utilities, access streets and alleys, and other servicing structures, appurtenances, and measures.

09 WILDLIFE LAND

Land managed primarily for wildlife.

10 STREAMS - Report by number of 100-foot stations.

Water flowing in a channel over three feet wide.

11 WETLANDS

Lowlands covered with shallow water during some period of the year.

12 LAKES AND PONDS

A body of water in a natural depression or man-made impoundment.

13 WINDBREAK

One or more rows of trees and/or shrubs that are used primarily as protection from wind.

14 ODD AREAS

Any area not having an identifiable use.

15 FENCE ROW - Report total length connected with quarter section sample by number of 100-foot stations.

Land used primarily for an artificial barrier dividing fields or properties.

16 OTHER LAND

Land used primarily for purposes not described above such as vegetable crops.

17 WATERWAYS OR HEADLANDS

Grassed waterways or headlands over 15 feet wide.

DOMINANT VEGETATION - The vegetation growing on most of the area considered.

01 DECIDUOUS TREES - Trees that shed all their leaves annually.

02 CONIFEROUS TREES - Cone bearing evergreen trees.

03 SHRUBS - Bushy, woody plants with several permanent stems.

04 ROW CROPS - All feed grain crops, i.e. corn, beans, sorghum, etc.

05 CEREAL CROPS - Wheat, oats, rye, barley, etc.

06 GRASS-LEGUME - A field having a grass and legume growing together.

07 LEGUME - A field growing a legume or combination of legumes.

08 COOL SEASON GRASSES - Except bluegrass, grasses growing mostly during the cool months such as Brome, Orchard, Reed Canary, Fescus, etc.

09 BLUE GRASS - self explanatory.

10 PRAIRIE GRASSES - Grasses growing during warm months such as Big Bluestem, Indiangrass, Little Bluestem, Switchgrass, etc.

11 SEDGES, CATTAILS OR BULRUSHES - Plants growing in or near water.

12 WEEDS - Annual or perennial plants growing uncontrolled.

13 OTHER - Any other vegetation not mentioned above.

GRAZING PRACTICE - The management of livestock.

1 HEAVY - Little forage left - overgrazing.

2 MODERATE - Some forage left - proper grazing.

3 SLIGHT - Very little grazing with a large amount of forage remaining.

4 FALL ONLY - Grazing is allowed only during fall months.

5 NONE - No grazing at any time.

LAND FORM - Location of land in a watershed.

1 UPLAND - Land located above floodplain.

2 BOTTOMLAND - Floodplain of any creek or river.

3 BOTH - Both upland and bottomland found in same field.

OWNERSHIP - Control of land by fee title.

1 PUBLIC - Owned by a governmental unit.

2 PRIVATE - Owned by an individual or corporation.

Appendix C-3 (continued)

DESCRIPTION OF LAND USE

CROPLAND

01 Intensive row crop - used 90% of crop years for production of row crops.

02 Rotation grass and/or legume less than one-half of the time - Row crops grown over one-half of the time. Report crop being grown at this time.

03 Rotation grass and/or legume over one-half of the time - Usually in grass and/or a legume crop but row crops occasionally grown. Report crop being grown at this time.

04 Fall Plowed - Any tillage operation in the fall.

05 Spring Plowed - Any tillage operation in the spring.

06 Mulch tillage - Crop residue is remaining on surface after planting operations.

FARMSTEAD

07 Habitated - Farmstead is currently occupied by someone.

08 Abandoned - Farmstead not lived in and will not be in the foreseeable future.

HAYLAND - No description.

GRASSLAND

09 One or two kinds of herbaceous cover.

10 Three to five kinds of herbaceous cover.

11 Six to 10 kinds of herbaceous cover.

12 25 to 40% of the area in large trees over 6 inches in diameter and/or shrubs.

13 25 to 40% of the area in small trees - less than 6 inches in diameter and/or shrubs.

14 10 to 25 percent of the area in mixed sizes of trees and/or shrubs.

15 Less than 10 percent of area in scattered, mixed sizes of trees and/or shrubs.

RECREATION - Self-explanatory

TRANSPORTATION - Self-explanatory

Appendix C-3 (Cont'd.)

DESCRIPTION OF LAND USE (continued)

WOODLAND

26 Over 50% of the area has undergrowth vegetation present - seedlings, shoots, small saplings or brush.

27 Under 50% of the area has undergrowth vegetation present - seedlings, shoots, small saplings or brush.

28 Open understory - no undergrowth.

29 Even age stand - Most of the trees are about the same size.

30 Varied age stand - Several sizes are present in the stand.

31 Mixed species stand - Several species of trees are growing.

32 Pure species stand - Only one or two species of trees are growing.

URBAN

33 Expanding population - Population has been increasing over last ten years.

34 Decreasing population - Population has been decreasing over last ten years.

35 Static population - Little change in population over last ten years.

STREAMS - Dominant vegetation will be the type of vegetation growing on stream banks.

36 No visible pollution - Not polluted.

37 Seasonal pollution - Polluted during periods of heavy runoff.

38 Continuously polluted - Self-explanatory.

39 Ephemeral flow - Flows only during period of runoff.

40 Intermittent flow - Continuous flow through some seasons of the year but little or no flow through other seasons.

41 Perennial flow - Flows at all times except during extreme drought.

42 Bank erosion on more than 50% of the bank area.

43 Bank erosion on 25-50% of the bank area.

44 Bank erosion on less than 25% of the bank area.

45 Banks stable - Little or no erosion.

DESCRIPTION OF LAND USE (continued)

WETLANDS

46 Open water - No emergent vegetation growing.

47 Emergent vegetation on 46-60% of the water area.

48 Emergent vegetation on less than 40% or more than 60% of the water area.

49 Area cultivated - Crops grown at some time.

50 Area not cultivated - Crops never grown.

51 Water continuously present.

52 Water present less than 6 months per year.

LAKES AND PONDS - Dominant vegetation will be the type growing on shore.

53 Seasonal pollution - Polluted seasonally nearly every year, such as during spring and fall rains - summer algae blooms.

54 Infrequent pollution - Polluted occasionally but not every year.

55 No pollution.

56 Continuous pollution - Always polluted.

57 Over 0.5 acre surface area

58 Under 0.5 acre surface area.

59 Minimum depth over ten feet.

60 Minimum depth under ten feet.

WINDBREAKS

61 Age class of trees 2 to 5 years - Windbreak has been planted less than 5 yrs.

62 Age class of trees 5 to 15 years - Windbreak has been planted between 5 & 15 years.

63 Age class over 15 years - Windbreak is over 15 years old.

ODD AREAS

64 Fenced - Livestock are excluded.

65 Not fenced - Livestock are not excluded.

FENCE ROWS - No description

APPENDIX C-3 (continued)

State 1 9 County __ __ SCD __ __ __ Sample Area __ __ __ __ __ __

Sub Basin __ __ __ __ __ __ State________ County________

Technician____________ Date________

Land Use: Code	Unit	Amount	Dominant Vegetation Code	Grazing Practices Code	Land Form Code	Ownership Code	Description of Land Use Code

LAND USE (sc. unless specified)
01 Cropland
02 Farmstead
03 Hayland
04 Grassland
05 Recreation
06 Transporta.
07 Woodland
08 Urban
09 Wildlife
10 Streams (100' Sts.)
11 Wetlands
12 Lakes & Ponds
13 Windbreaks
14 Odd Areas
15 Fence Rows
16 Other (100' Sta)
17 waterways or headland

UNIT
A Acre
B 100' Stations

LAND FORM
1 Upland
2 Bott.land
3 Both

GRAZING PRACTICE
1 Heavy
2 Moderate
3 Slight
4 Fall only
5 None

OWNERSHIP
1 Public
2 Private

Code Symbols

DOMINANT VEGETATION
01 Decid. Trees
02 Conif. Trees
03 Shrubs
04 Row Crops
05 Cereal Crops
06 Grass-Legume
07 Legume
08 C.S. Grasses
09 Blue Grass
10 Prairie Grasses
11 Sed.,Cat. or Bul.
12 Weeds
13 Other

DESCRIPTION OF LAND USE

CROPLAND
01 Intens. row crop
02 Rota. grass &/or leg. un.½
03 Rota. grass &/or leg. ov.½
04 Fall plowed
05 Spring plowed
06 Mulch tillage

FARMSTEAD
07 Habitated
08 Abandoned

HAYLAND - No description.

GRASSLAND
09 1-2 kinds herba. cover
10 3-5 kinds herba. cover
11 6-10 " " "
12 25-40% large trees &/or shrubs
13 25-40% small " " "
14 Mix. sizes trees &/or shrubs 10-25%
15 Scattered, mix. sizes trees & shrubs un. 10%

RECREATION
16 Picnic area
17 Camping
18 Water sports
19 Field sports
20 Fishing-Hunting
21 3 or more of above

TRANSPORTATION
22 Gravel or dirt road
23 Hard surfaced road
24 Railroads
25 Airports

WOODLAND
26 Ov.50% undergrowth cover
27 Un.50% undergrowth cover
28 Open understory
29 Even age stand
30 Varied age stand
31 Mixed species stand
32 Pure species stand

URBAN
33 Expand. population
34 Decreas. pop.
35 Static population

WILDLIFE - No description

STREAMS
36 No pollution
37 Seasonal pollution
38 Contin. pollution
39 Ephemeral flow
40 Intermit. flow
41 Perennial flow
42 Bank eros.-50% of area
43 Bank eros. 25-50% "
44 Bank eros. un.25% "
45 Banks stable

WETLANDS
46 Open water
47 Emerg. veg.-40-60% of area
48 Emerg. veg.-un.40%, ov.60%
49 Cultivated
50 Not cultivated
51 H_2O Contin. present
52 H_2O un. 6 mo/yr

LAKES AND PONDS
53 Seas. pollution
54 Infrequent pollu.
55 No pollution
56 Contin. pollu.
57 Ov. .5-ac surf.area
58 Un. .5-ac " "
59 Min. dep. ov. 10ft
60 Min. " un. 10ft

WINDBREAKS
61 Age class 2-5 yrs
62 Age class 5-15 yrs
63 Age class ov. 15"

ODD AREAS
64 Fenced
65 Not fenced

FENCE ROWS - No description

OTHER - No description

WATERWAYS OR HEADLANDS - No description

APPENDIX C-4

WILDLIFE HABITAT QUALITY DESCRIPTION

Iowa-Cedar Rivers Basin

1. Northern Portion

Cropland provides much of the food and habitat needs of wildlife species because of the large acreage devoted to this use. About 81 percent of this portion of the Basin is used for cropland.

The quality of cropland is affected by such factors as crop rotations, tillage, and grazing. There is little crop diversification with 93 percent of the cropland area in corn or soybeans in 1973. This is believed to be a representative year of the cropping portion since only 4 percent of the cropland is farmed on a rotation in which grass or legumes are used more than one-half the time.

About 73 percent of the cropland is prepared for crops by fall plowing, 20 percent by spring plowing, and 5 percent by some form of conservation tillage. After crops are harvested fields are often grazed by livestock. Approximately 45 percent of this area is grazed at some time of the year, usually after harvest.

The grassland habitat type consists of pastureland, hayland, grassed waterways, and miscellaneous smaller grassy areas. The best quality grassy habitat cover is usually in small grain and legume crops.

Pastureland generally is found on land that is not suitable for cropping such as areas adjacent to watercourses; it is the largest land use of the grassy habitat type. Bluegrass is the dominant vegetation on 60 percent of the pastureland acreage and grazing is heavy on 84 percent.

Hayland is important for nesting cover and usually consists of a grass-legume mix. Sixty-two percent is grazed during some portion of the year which reduces its value for winter cover and nearly all is mowed for hay. About 1.5 percent of this portion of the Basin is used for hayland which is less than the amount used for farmsteads.

Grassed waterways, which account for less than one-half of 1 percent of this area, are used to convey excess water from cropland. They consist of narrow strips of tall, cool season grasses which can provide wildlife cover. About 50 percent are grazed by livestock during some portion of the year.

Transportation routes, including roads, railroads, and airports, can be beneficial to wildlife because they usually have a high quality grass cover. Roads account for nearly 89 percent of this

use with railroads slightly over 11 percent. Roadsides provide much of the nesting cover for pheasant.

Farmsteads average 3 acres in size and provide nesting and winter cover for pheasant, rabbit, and song birds. There are approximately 23,000 farmsteads which utilize 2.4 percent of the area. Of these, 15 percent or 3,450 are abandoned.

Windbreaks are associated with about 50 percent of the farmsteads. They average 1.5 acres in size and are important for winter cover for many wildlife species.

Forest land is limited in the northern portion of the Basin, occurring on 1.4 percent of the area. Forest land usually occurs on land that is unsuited to either row crops or pasture, or on land that is publicly owned.

Wildlife land is a minor land use that can be very important to a variety of wildlife species. Most are composed of deciduous trees and bluegrass and occur in small areas that are widely dispersed. These areas are maintained for wildlife habitat, however, about 40 percent are grazed during some portion of the year.

Idle lands are usually areas that are not economical to farm. Deciduous trees, cool season grasses, and weeds are the dominant plants. These areas provide good wildlife cover because of their permanence and small amount of disturbance that occurs by grazing.

The vegetation in most fence rows is dominated by cool season grasses. Most are narrow averaging 4 to 5 feet which limits their value as wildlife cover.

2. Southern Portion

The southern portion of the Basin has more diversity in the land use pattern than the northern portion. This creates habitat favorable to more wildlife species. Many of the management practices are also beneficial to wildlife; however, more livestock operations, such as cow-calf herds, affect wildlife habitat. Seventy percent of all the land in the southern portion is grazed during some portion of the year as opposed to 45 percent in the northern portion in Iowa.

Approximately 89 percent of the cropland was in row crops in 1973. The remaining 11 percent was in grassy habitat crops, such as oats, grass, and/or legumes. Less than 50 percent of the cropland is used for intensive row crop production with the remainder farmed on a rotation involving grass and/or legumes.

Twenty-two percent of the area is fall plowed and mulch tillage is used on 5 percent. Seventy-five percent of all cropland is grazed during some period of the year; the majority is in the fall after

harvest. The relatively large amount of cropland available supplies enough of this habitat type to meet the needs of certain wildlife species.

Grassland used for pasture comprises the major portion of the grassland habitat type. Bluegrass is the dominant vegetation on 46 percent of this area and cool season grasses associated with improved pastures are found on 34 percent. Various sizes and concentrations of trees and/or shrubs are found on 58 percent of the pasture area. Grazing is heavy on 72 percent of the area and less than 2 percent is not grazed. Nearly 15 percent of this area is used for pasture which reflects the importance of livestock in this portion of the Basin.

Hayland is the land use of 5 percent of this area. The vegetation consists mainly of grass-legume or straight legume seedings. Most are mowed for three hay crops with the first cutting occurring in May or June. Over 90 percent of the hayland is grazed during some period of the year with most of it occurring in the fall.

Grassed waterways are more abundant in this portion of the Basin and add diversity to cropland habitat. The vegetation is mostly cool season grasses and grazing occurs on 80 percent of this area.

Transportation routes are mostly roads with about 7.5 percent in railroads. Roadsides are not as important for nesting areas as in the northern portion; however, they do provide some grassy habitat. Railroads usually have a variety of vegetative types which provide good wildlife habitat.

Farmsteads average 2 acres in size and provide habitat for a variety of wildlife species including rabbit, squirrel, pheasant, and quail. There are approximately 25,000 farmsteads which cover about 2.3 percent of the area. Of these 10 percent or 2,500 are abandoned.

Windbreaks occur on less than 19 percent of the farmsteads in this portion of the Basin. The average size is 1.4 acres and they are used for winter cover by several wildlife species.

Forest land provides habitat for a variety of wildlife species. In addition the edge created when forest land meets other land uses is some of the most valuable wildlife habitat.

The primary use of one percent of the land in farms is for wildlife habitat. Deciduous trees are the dominant vegetation on 77 percent and cool season grasses on 17 percent of this area. Grazing is heavy on 20 percent of the wildlife area while 65 percent are not grazed.

Idle areas are generally small, averaging less than 4 acres in size. They have deciduous trees on 42 percent of the area and grasses or legumes on 28 percent. Fifty-five percent are grazed during some portion of the year, with 6 percent heavily grazed.

Threatened wildlife species do not reside in the Basin. The Peregrine Falcon, listed by the U.S. Fish and Wildlife Service, as being a threatened species, has been sighted in the Basin during migration periods. The threatened Southern Bald Eagle also occurs occasionally during migration periods. The range of the threatened Indiana Bat extends into a small portion of the area. It probably does not occur because of the lack of limestone caves that are an important component of its habitat. No documentation of its occurrence is available in the area.

PUBLIC RECREATION AREAS
Iowa-Cedar Rivers Basin

COUNTY	NAME OF SITE	LAND & WATER ACRES	TYPE OF SITE				AGENCY
			REC.	FOR.	REFUGE	PUB. HUNT.	
Benton	Mt. Auburn Bridge	60	X				County
"	Minne Estema	60	X				State-County
"	Milroy Access	3	X				County
"	Dudgeon Lake	1257	X			X	State--Fish, Game
"	Wildcat Bluff	119	X				County
"	Benton City-Fry Access	39	X				County
"	Hoefle-Dulin Access	52	X				County
"	Kiwanis Wayside	4	X				State
"	Hannen Park	180	X				County
"	Roger's Park	170	X				County
	Subtotal	1944					
Black Hawk	West Fork River Area	238	X				County
"	Thunderwoman Park	96	X				County
"	Ford River Access	1	X				County
"	Falls Access	269	X			X	State, Fish & Game
"	Cedar River Green Belt	250	X				County
"	Black Hawk Park	1095	X				County
"	Perry Canfield Park	40	X				County
"	George Wyth Memorial State Park	419	X				State, Land & Water
"	Black Hawk Green Belt	351	X				County
"	Sargent Memorial Hwy Rest Area	4	X				County
"	Popp Access	69	X			X	County
"	Seyfer Access	4	X			X	County
"	Black Hawk County Access	60	X				County
"	Indian Hills River Access	76	X				State-County
"	Gilbertville Park	5	X				County
"	Evansdale Cedar River Access	20	X				County
"	Elk Run Park	26	X				County
"	Casebeer Heights Access Area	20	X				County
"	Highway #63 Wayside	2	X				County
"	Washington Union Park	190				X	County
"	Hickory Hills Park (in Tama County)	(490)	X				County
	Subtotal	3235					

Appendix D-1 (Continued)

COUNTY	NAME OF SITE	LAND & WATER ACRES	TYPE OF SITE REC	FOR	REFUGE	PUB. HUNT	AGENCY
Bremer	Washington Twp Wayside	1	X				State
"	Cedar Bend Park	184	X				County
"	Janeville Wayside	1	X				State
"	Safety Rest Area	1	X				County
"	Brandt Park	10	X				County
	Subtotal	197					
Buchanan	Lime Creek Area	38	X			X	County
Butler	Lake Considine	90	X				County
"	Big Marsh	2813				X	State, Fish & Game
"	Beaver Meadows	32	X				State, County
"	Moore Recreation Area	35	X				County
"	Shell Rock Park	10	X				County
"	Heery Woods	380		X			State, Land & Water
"	Greene Recreational Park	1	X				County
"	Camp Comfort	20	X				County
"	Fremont Twp. Wildlife Habitat Area #1	25			X		County
"	Jct. #3 & 14 Wayside	1	X				State
"	Wayside # 14	1	X				State
"	Wayside # 3	1	X				State
	Subtotal	3409					
Cedar	Red Oak Park	7	X				County
"	Cedar Valley Green Belt	227	X				County
"	Herbert Hoover Natural Historic Site	200	X				Federal
"	Rochester Area	3	X				County
"	Interstate 80 Wayside	10	X				State
"	Bennett Park	75	X				County
	Subtotal	522					
Cerro Gordo	Mallard Marsh	227			X	X	County
"	Kuhn Wildlife Area	78			X		County
	Clear Lake Hatchery	3			X		State, Fish & Game

Appendix D-1 (Continued)

COUNTY	NAME OF SITE	LAND & WATER ACRES	TYPE OF SITE				AGENCY
			REC.	FOR.	REFUGE	PUB. HUNT.	
Cerro Gordo	Gerk Rec. Area	70	X				County
"	Clear Lake Access	7	X				State, Fish & Game
"	Headquarters Area	4	X				State, Fish & Game
"	Ventura Marsh	472	X			X	State, Fish & Game
"	McIntosh Woods	60		X			State, Land & Water
"	South Shore Access	75	X				State, Land & Water
"	Lekwa Area	36	X			X	State, Fish, Game, Land & Water
"	Clear Lake State Park	92	X				State, Land & Water
"	Clear Lake Outlet	1	X				State, Land & Water
"	Ingebretson	23	X				County
"	Zirbel Slough	130			X	X	County
"	Linn Grove Park	38	X				County
"	Clay Banks Forest	56	X		X		County
"	Averydale Access	6	X				County
"	Shell Rock River Area	454	X		X	X	County
"	Wilkinson Park	61	X				County
"	White Wildlife Area	28			X	X	County
"	Shell Rock River Green Belt Addition	113	X				County
"	Clear Lake	3643	X			X	State-Sovereign
"	Clear Lake Pond	41	X			X	State, Fish & Game
"	Mason City Wayside	1	X				State
"	Hwy #65 Wayside	1	X				State
	Subtotal	5720					
Chickasaw	Chickasaw Mill	16	X			X	State-County
"	Little Brown Church Wayside	1	X				State
	Subtotal	17					
Des Moines	Franklin Twp. Lake Park	411	X			X	County
"	Chautauqua Park	10	X				County
"	Lukenbill Woods	32		X			County
"	Allen Green Refuge	152			X		State, Fish & Game
"	Zion School Museum	1	X				County
"	Tama Beach	3	X				State-County

Appendix D-1 (Continued)

COUNTY	NAME OF SITE	LAND & WATER ACRES	TYPE OF SITE				AGENCY
			REC	FOR	REFUGE	PUB. HUNT	
Des Moines	Edgewater Beach	2	X				State-County
"	U. S. Hwy. 61 Safety Rest Area	9	X				County
"	Hunt Forest Area	58		X			County
"	Lock & Dam No. 18	Miss. River	X				Federal
"	Ordinance Plant	20	X				Federal
"	Huron Slough	120			X	X	Federal
"	Casey Borrow Landing	1	X				Federal
"	Flint Hills Park	120	X				County
	Subtotal	939					
Floyd	Colwell Park	19	X				County
"	Meyer Forest Area	102		X			County
"	Idlewild Access	136	X			X	State-County
"	Rudd U.S. Hwy. 18 Safety Rest Area	6	X				County
"	Nora Springs Mill Dam Park	27	X				County
"	Mathers' Forest Area	50		X			County
"	Rockford Park	18	X				County
"	Gates Bridge Access	4	X				County
"	Marble Rock Access	3	X				County
"	Ackley Creek County Park	40	X				County
"	Hwy. 14 Wayside	1	X				State
"	Charles City-Cedar River Dock	1	X				County
"	Floyd Co. Museum	1	X				County
"	Howard Woods	20		X			County
"	US Hwy. 218 Rest Safety Area	2	X				County
"	Bunn's Woods	38		X			County
"	Flora Ellis Bird and Wildlife Sanctuary	10			X		County
"	Floyd Roadside City Park	4	X				County
"	Rotary Park	17	X				County
	Subtotal	499					
Franklin	Loomis Memorial Park	1	X				County
"	Alexander Park	1	X				County
"	Hawkins Game Area	1			X	X	County
"	Latimer Ball Field	3	X				County
"	Toft Park	13	X				County
"	Oakland-Iowa River Access	74	X			X	County
"	PopeJoy Area	67	X			X	County
"	Mallary Park	71	X			X	County
	Burkley Historical Area	6	X			X	County

Appendix D-1 (Continued)

COUNTY	NAME OF SITE	LAND & WATER ACRES	TYPE OF SITE REC.	FOR.	REFUGE	PUB. HUNT.	AGENCY
Franklin	County Fairgrounds	4	X				County
"	Beeds Lake State Park	319	X				State, Land & Water
"	Robinson Park	30	X			X	County
"	Mott Forest Area	54		X			County
"	Handorf Park	4	X				County
"	West Fork Fishing Access	80	X			X	State-County
"	Zion-St. John Park	2	X				County
"	Galvin Park	6	X			X	County
"	Oakland Valley Game Mgt. Area	2				X	County
"	Sheffield Game Mgt. Area	16	X			X	County
"	Hwy. 65 Wayside	1	X				County
"	WKW Park	54				X	County
	Subtotal	799					
Freeborn, Minn.	Geneva Lake State Park	1947	X				State
"	Halls Lake Wildlife Management Area	472				X	State
"	Freeborn County Fairgrounds	44	X				County
"	Pickeral Lake Public Access	566	X				State
"	Wayside Parking Area	1	X				State
"	Lower Twin Lake	556	X				County-community
"	Wayside Parking L. Twin Lake	1	X				State
"	Bear Lake State Wildlife	1636				X	State
"	Emmons Wayside Route 69	1	X				State
"	Helmer Myre State Park	346	X				State
"	Wayside Parking Area	1	X				State
	Subtotal	5571					
Grundy	Beaver Arboretum	1		X			County
"	Stoche Fishing Area	3	X				County
"	Pine Lake W.S. Boundary	63	X				State, Land & Water
"	Miller Memorial Area	3	X				County
"	Nason Rest Area	1	X				County
"	Conrad Lime Quarry	5	X				County
"	Wolf Creek Recreational Area	93	X				County
"	Beamon Arboretum	5		X			County
"	Shearn Rest Area	1	X				County

Appendix D-1 (Continued)

COUNTY	NAME OF SITE	LAND & WATER ACRES	TYPE OF SITE				AGENCY
			REC.	FOR.	REFUGE	PUB. HUNT.	
Grundy	Reinbeck Rest Area	1	X				County
"	Roadman Roadside Park	10	X				County
"	Berend Wildlife Area	2			X		County
"	Herbert Gutnecht Park	1	X				State-County
	Subtotal	189					
Hancock	Crystal Lake	283	X			X	State-Sovereign
"	Ellsworth Park	130	X				State-County
"	Pilot Knob State Park	369	X				State, Land & Water
"	Wild Goose Park	62	X				County
"	Ventura Marsh	279			X	X	State, Fish & Game
"	Court House Square	2	X				County
"	Ell Township Roadside Park	2	X				County
"	East Twin Lake Forest Area	9		X		X	County
"	Eldred Sherwood Park	100	X				County
"	Goodell Area	73				X	State, Fish & Game
"	East Twin Lake Park Game Area	1			X		County
"	East Twin Lake	493	X			X	State-Sovereign, Fish & Game
"	West Twin Lake	109	X			X	State-Sovereign
"	Eagle Lake Forest Preserve	46		X		X	County
"	Eagle Lake State Park	919	X			X	State, Sovereign, Fish & Game
"	Concord Park	2	X				County
"	Eagle Lake Area	21	X				State-County
	Subtotal	2900					
Hardin	Begelow Park	10	X				County
"	Bessman-Kemp	10	X				County
"	Alden River Dam	1	X				County
"	Stienberg Wildlife Area	3	X			X	County
"	Irvan Elms	4	X				County
"	Flowing Well Park	13	X				County
"	Gehrke Wildlife Area	6			X	X	County
"	Boddy-Hunt Recreation Area	46	X				County

Appendix D-1 (Continued)

COUNTY	NAME OF SITE	LAND & WATER ACRES	TYPE OF SITE				AGENCY
			REC.	FOR.	REFUGE	PUB. HUNT.	
Hardin	Utech Wildlife Area	2			X		County
"	Highway 20 Rest Area	4	X				County
"	Ira Nichols Bird & Wildlife Area	16			X		County
"	Robb River Access	5	X				County
"	Ferris Wilderness Unit	247			X		County
"	Ox Bow Lake	20	X		X		County
"	Sylvan Hill Park	61	X				State-County
"	Mann Wilderness Unit & Nichols Timber	148			X		County
"	Hartman Wildlife Area	10			X	X	County
"	Steamboat Rock Tower	21	X				County
"	Steamboat Rock Access	5	X				State-County
"	Pine Lake-Iowa River Access	17	X				State-County
"	Pine Lake State Park	542	X				State, Land & Water
"	Reece Memorial Park	75	X				County
"	Long Memorial Park	7	X				County
"	Hardin City Access	25	X				State-County
"	Iowa River Greenbelt	771	X			X	County
"	Lepley Memorial Park	9	X				County
"	Twin Elms Park	4				X	County
"	Zilman Wildlife Area	10				X	County
"	Highway #65 Wayside	1	X				State
"	Hansen Swamp	11			X		County
"	Wilkinson Wildlife	40	X	X	X		County
"	Setchell Area	35			X		County
"	Leverton Timber	205		X	X		County
"	Robinson Wildlife	26			X		County
"	Wildlife Cave Access	7			X		County
	Subtotal	2417					
Iowa	Randolph	389	X			X	State, Fish & Game
"	Kozia	61	X			X	State, Fish & Game
"	Iowa County Park	392	X				County
"	Highway 212 Wayside	1	X				State
"	Highway 6 Wayside	1	X				State
	Subtotal	844					
Johnson	Hawkeye Wildlife Area	14,000	X		X	X	State & Corps Engrs.
"	Swan Lake	44	X			X	State-Sovereign
"	Curtis Bridge	9	X				Corps Engineers
"	Mid-River Park	13	X				Corps Engineers

Appendix D-1 (Continued)

COUNTY	NAME OF SITE	LAND & WATER ACRES	TYPE OF SITE REC.	FOR.	REFUGE	PUB. HUNT.	AGENCY
Johnson	218 Marina	7	X				Commercial
"	Sandy Beach	48	X				Corps Engineers
"	Lake McBride	1970	X				State, Corps Engineers
"	Coralville Docks	13	X				Commercial
"	Green Castle Area	8	X				County
"	Stainbrook St. Preser. & Old St. Quarry	32	X				County
"	Sugar Bottom	780	X				Commercial
"	Coralville Dam	5	X				Corps Engineers
"	West Overlook	61	X				Corps Engineers
"	Coral Marina	22	X				Commercial
"	Turkey Creek Heights	41	X				Corps Engineers
"	Linder Point	95	X				Corps Engineers
"	Tailwater West	13	X				Corps Engineers
"	Tailwater East	10	X				Corps Engineers
"	Squire Point (undeveloped)	70	X				Corps Engineers
"	Plum Grove	4	X				State, Land & Water
"	FW Kent Park	217	X			X	County
"	Highway 6 Rest Area	5	X				County
"	Hills Access	40	X				County
"	River Junction Access	12	X				County
"	Walker Park	1	X				County
"	Ten Corps Area	100	X				Federal
"	Scott Church Wayside	23	X				State
"	Hwy. 218 Wayside	1	X				State
	Subtotal	17,644					
Keokuk	South English Wayside	1	X				State
Linn	Wakema Park	4	X				County
"	Lewis Wildlife & Timber Area	455		X	X		County
"	Wickiup Hill	178	X			X	County
"	Palo Marsh	144			X	X	County
"	Chain Lakes	64	X				County

Appendix D-1 (Continued)

COUNTY	NAME OF SITE	LAND & WATER ACRES	TYPE OF SITE				AGENCY
			REC.	FOR.	REFUGE	PUB. HUNT.	
Linn	Morgan Creek Park	104	X				County
"	Rock Island Area	20	X				County
"	Palisades-Dows Area	162	X				County
"	Palisades Access	89	X			X	State-County
"	Palisades-Kepler	599	X				State, Land & Water
"	Abbe Creek School Museum	2	X				County
"	South Cedar Access	162	X			X	County
"	Squaw Creek Park	591	X				County
	Subtotal	2574					
Louisa	Cone Marsh	613				X	State, Fish & Game
"	Lake Odessa	3207	X				Federal-State
"	Terry Landing Area	15	X				Federal
"	Toolesboro Access	4	X				Federal-State
"	Sand Run Access	3	X				Federal-State
	Subtotal	3842					
Marshall	French Grove Park	29	X			X	County
"	Leise Forest & Wildlife Area	80		X	X	X	County
"	Bangor Public Square	2	X				County
"	Timmons Grove Park	198	X			X	County
"	Grammer Grove Wildlife Area	120			X		County
"	Nicholson Ford	107				X	State, Fish & Game
"	Three Bridges Area	12	X			X	County
"	Holland Access	80	X			X	County
"	C.D. Coppock Park	9	X				County
"	State Center Rest Area	1	X				State
"	Highway 330 Rest Area	1	X				State
	Subtotal	639					
Mitchell	Ortranto Park	5	X				County
"	Staceyville Park	7	X				County
"	Gerbig's Woods	20		X			County
"	Pioneer State Park	14	X				State, Land & Water
"	Koon's Forest	8		X			County
"	New Haven Potholes	165	X				County
"	Interstate Park	25	X				County

Appendix D-1 (Continued)

COUNTY	NAME OF SITE	LAND & WATER ACRES	TYPE OF SITE				AGENCY
			REC.	FOR.	REFUGE	PUB. HUNT.	
Mitchell	Halvorson Park	11	X				County
"	Highway 9 Wayside	1	X				State
	Subtotal	256					
Mower (Minn.)	Campground (Rose Creek)	5	X				County
"	Route 56 Wayside	1	X				State
"	Rose Creek Wildlife Mgt. Aerie	50				X	State
"	Red Cedar Hunting Area	41				X	State
"	Brandt Larson Hunting Area	171				X	State
"	Cartney Slough	320				X	State
	Subtotal	588					
Muscatine	Cedar River Access	733	X				State, Fish & Game
"	Salisbury-Cedar River Access	477	X				County
"	Wiese Slough	1549				X	State, Fish & Game
"	Moscow-Cedar River Access	4	X				County
"	Hwy 6 & 38 Wayside	1	X				State
	Subtotal	2764					
Poweshiek	Brooklyn Rec. Area	7	X				County
"	Deep River Park	9	X				County
"	Guernsey Park	5				X	County
	Subtotal	21					
Story	Dakins Lake	17	X			X	County
Tama	Union Grove	282	X				State, Land & Water
"	T.F. Clark Park	24	X				County
"	Hickory Hills Park	498	X				County (Black Hawk)
"	Otter Creek Park	277	X				County
"	Manatt's Iowa River Access	6	X				County
"	Otter Creek Marsh	3009				X	State, Fish & Game
"	Chelsea Boat Ramp	1	X				County
"	Tama Wayside	1	X				State
	Subtotal	4098					

Appendix D-1 (Continued)

COUNTY	NAME OF SITE	LAND & WATER ACRES	TYPE OF SITE				AGENCY
			REC.	FOR.	REFUGE	PUB. HUNT.	
Washington	Foster Timber Area	17		X			County
"	Iowa Township Park	27	X				County
"	Hayes Timber	34		X			County
"	Marr Park	40	X				County
"	Ainsworth Wayside	1	X				County
	Subtotal	119					
Winnebago	Harmon Lake	483				X	State-Sovereign Fish & Game
"	Dahle Fishing Access	9	X		X	X	County
"	Hogsback Area	149	X				County
"	Rice Lake Area	1071	X			X	State-Sovereign Fish & Game
"	Rice Lake State Park	47	X				State-Sovereign Fish & Game
"	Winnebago River Rec. Area	47	X				County
"	Leland Wayside	1	X				State-County
"	Ambroson Park	18	X			X	County
"	Forest City Wayside	1	X				State
	Subtotal	1826					
Worth	Bright's Lake	122	X			X	State-Sovereign
"	Silver Lake Marsh	109				X	State, Fish & Game
"	Silver Lake Access	9	X				County
"	Silver Lake Area	448				X	State-Sovereign
"	Christianson Taylor Wildlife Area	194			X		County
"	Taylor Wildlife Area	6			X		County
"	Ochee Yahola Park	160	X				County
"	Hartland Forest Area	40		X			County
"	Dixon Timber Area	160		X			County
"	Hwy 65 Wayside	1	X				State
"	Stime Timber	165		X			County
"	Turvold Woods	32		X			County
"	Gullikson Area	40	X				County
"	Deer Creek Forest & Game Area	95	X	X		X	County

Appendix D-1 (Continued)

COUNTY	NAME OF SITE	LAND & WATER ACRES	TYPE OF SITE				AGENCY
			REC.	FOR.	REFUGE	PUB. HUNT.	
Worth	Deer Creek Roadside Park	1	X				County
"	Worth County Lake	8	X				County
"	Helgeland Wildlife Area	5			X		County
"	Myre Wildlife Area	3			X		County
"	Hwy 9 Wayside	1	X				State
"	Fertile Mill Dam	10	X				County
"	Haugen Timber Area	12		X			County
"	Brunsvold Forest & Wildlife Area	19		X	X	X	County
"	Rice Lake Area	760	X				State, Fish & Game
"	Elk Creek	1558	X			X	State, Fish & Game
	Subtotal	3958					
Wright	Benton Wildlife Area	80			X		County
"	Pikes Timber Park	46		X			County
"	Solberg Roadside Park	2	X				County
"	Bingham Park	12	X			X	County
"	Dows Park	3	X			X	County
"	Elm Lake	466	X			X	State-Sovereign Fish & Game
	Subtotal	609					
	Minnesota Total---------	6,159					
	Iowa Total-------------	62,037					
	Grand Total------------	68,196					

APPENDIX D-2

DAMS LICENSED IN ACCORDANCE WITH CHAPTER 469, CODE OF IOWA 1954

Iowa-Cedar Rivers Basin

County	Stream	Location	Description	Height (feet)	Length (feet)	Purpose	Year Built or Rebuilt	Ownership
Black Hawk	Cedar R.	Cedar Falls	Concrete	9.5	352	Hydro-power (1610 HP)	1938	City of Cedar Falls
Black Hawk	Cedar R.	Waterloo	Concrete	8	589	Condenser water	1924	Iowa Public Service Co.
Black Hawk	Cedar R.	Waterloo	Concrete	2	850	Esthetic Development	1931	Riverfront Improvement Commission
Bremer	Cedar R.	Waverly	Concrete	10	344	Hydro-power (610 HP)	1948	City of Waverly
Butler	Shell Rock R.	Greene	Rock, concrete	9	235	Recreation	1925	Butler County Conservation Board
Cerro Gordo	Calmus Creek	Mason City	Concrete	5	60	Condenser water	1912	Lehigh Portland Cement Co.
Cerro Gordo	Willow Cr.	Mason City	Concrete	5	88	Condenser water	1947	Interstate Power Co.
Cerro Gordo	Winnebago R.	Mason City	Concrete	4	125	Industrial water	1917	American Crystsl Sugar Company
Chickasaw	Cedar R.	Nashua	Concrete	17	254	Hydro-power (770 HP)	1916	Iowa Public Service Co.
Floyd	Cedar R.	Charles City	Concrete	8	236	Recreation	1946	City of Charles City
Floyd	Shell Rock R.	Marble Rock	Concrete	18	155	Recreation	1913	City of Marble Rock
Hardin	Iowa R.	Alden	Concrete	7	265	Recreation	1932	City of Alden
Hardin	Iowa R.	Iowa Falls	Concrete	28	144	Hydro-power (1180 HP)	1925	Iowa Electric Light and Power Company
Iowa	Iowa R.	Amana	Wood, concrete	4	170	Hydro-power (350 HP)	1908-11	Amana Society
Johnson	Iowa R.	Coralville	Concrete	14	293	Recreation	1922	Johnson County Conservation Bosrd
Linn	Cedar R.	Cedar Rapids	Concrete	10	572	Hydro-power (1610 HP)	1914	City of Cedar Rapids and Iowa Electric Light and Power Company
Linn	Cedar R.	Cedar Rapids	Concrete	7	665	Cooling water	1966	Iowa Electric Light and Power Company
Mitchell	Cedar R.	Mitchell	Concrete	18.1	125	Recreation	1925	Mitchell County Conservation Board
Tama	Iowa R.	Tama	Piling, earth, miac. materials	10	275	Industrial water	1874	Packaging Corporation of America

PROPOSED RECREATIONAL AREAS
(Based on State Recreation Plans)
Iowa-Cedar Rivers Basin

IOWA SUBBASIN

County	Name of Recreation Area	Land & Water Acreage	Type of Site: Rec.	Type of Site: For.	Type of Site: Refuge & Pub. Hunting	Cost ($): Acquisition	Cost ($): Development	Administering Agency
Franklin	Taft Park Area	30	X			500	no est.	CCB
"	Iowa River Corridor	200	X			20,000	"	CCB
Hancock	Twin Lake	8	X			8,000	"	ICC(L&W)
Hardin	Iowa River Green Belt	3,019	X			654,850	"	CCB
"	Pine Lake	427	X			128,200	148,200	ICC(L&W)
	Begelow Park	10	X			2,000	no est.	CCB
	South Fork	100	X			20,000	"	CCB
	Hardin Co. Game Mgt. Area	500			X	100,000	10,000	ICC(F&G)
Iowa	Iowa Co. Park	133	X			42,000	13,375	CCB
	Game Mgt. Area, Iowa Co.	400			X	85,000	15,000	ICC(F&G)
Johnson	F.W. Kent Park	1,012	X			448,800	470,544	CCB
"	Lake McBride	58	X			91,000	454,500	ICC(L&W)
"	Scenic Easement	190	X			118,200	no est.	IHC
"	Iowa River Bottoms	500			X	75,000	"	ICC(F&G)
	Subbasin Total	6,587	11	-	3	1,793,550	1,111,419	

Number of sites in Subbasin = 14

CEDAR SUBBASIN

County	Name of Recreation Area	Land & Water Acreage	Type of Site			Cost ($)		Administering Agency
			Rec.	For.	Refuge & Pub. Hunting	Acquisition	Development	
Benton	Benton Co. Game Mgt. Area	500			X	50,000	5,000	ICC(F&G)
Blackhawk	Cedar River Green Belt	400	X			120,000	no est.	CCB
"	Hickory Hills Addition	500	X			300,000	"	CCB
"	Black Hawk Co. Game Area	500			X	100,000	87,575	ICC(F&G)
Bremer	Cedar Green Belt	40	X			4,000	no est.	CCB
"	Waverly Air Base	15	X			25,000	13,100	CCB
Linn	Pleasant Cr. Palo Res.	2,258	X			850,000	1,100,000	ICC(L&W)
"	Palisades Kepler	204	X			64,300	11,000	ICC(L&W)
"	Linn Co. Game Mgt. Area	500			X	50,000	5,000	ICC(F&G)
Muscatine	Salesburg Bridge Rec. Area	806	X			100,000	20,700	CCB
"	Wildcat Den	200	X			60,000	18,000	ICC(L&W)
Mitchell	Trout Stream	75	X			12,500	no est.	ICC(F&G)
"	Mitchell Co. Game Mgt. Area	1,000			X	20,000	20,000	ICC(F&G)
	Subbasin Total	6,998	9	-	4	1,755,800	1,280,375	

Number of sites in Subbasin = 13

SHELL ROCK SUBBASIN

County	Name of Recreation Area	Land & Water Acreage	Type of Site			Cost ($)		Administering Agency
			Rec.	For.	Refuge & Pub. Hunting	Acquisition	Development	
Bremer	Shell Rock Green Belt	100	X			10,000	no est.	CCB
Cerro Gordo	Clear Lake	45	X			119,537	26,000	ICC(L&W)
"	McIntosh Woods	327		X		348,800	35,000	ICC(F&G)
"	Mallard Marsh	8			X	3,200	1,300	CCB
"	Scenic Easement	336	X			78,225	no est.	IHC
"	Cerro Gordo Game Mgt. Area	1,000			X	500,000	50,000	ICC(F&G)
Hancock	Pilot Knob	455	X			136,500	51,182	ICC(L&W)
Winnebago	Lande River Cons. Area	160	X			24,000	no est.	CCB
	Winnebago Co. Game Mgt. Area	1,000			X	300,000	30,000	ICC(F&G)
Worth	Highway Rest Area	24	X			19,699	no est.	IHC
	Scenic Easement	88	X			12,000	"	IHC
	Worth Co. Game Mgt. Area	500			X	150,000	15,000	ICC(F&G)
	Subbasin Total	4,043	7	1	4	1,701,961	208,482	

Number of sites in subbasin = 12

WEST FORK CEDAR SUBBASIN

County	Name of Recreation Area	Land & Water Acreage	Type of Site			Cost ($)		Administerin Agency
			Rec.	For.	Refuge & Pub. Hunting	Acquisition	Development	
Butler	Big Marsh	500			X	200,000	20,000	ICC(F&G)
"	Butler Co. Game Mgt. Area	500			X	200,000	20,000	ICC(F&G)
Cerro Gordo	Zirbel Slough	240			X	84,000	47,000	CCB
Franklin	Beeds Lake	420	X			176,000	131,000	ICC(L&W)
"	Robinson Park Area	30	X			1,000	700	CCB
	Subbasin Total	1,690	2	-	3	661,000	218,700	

Number of sites in subbasin = 5

Appendix D-3 (Continued)

FLINT SUBBASIN

County	Name of Recreation Area	Land & Water Acreage	Type of Site			Cost ($)		Administering Agency
			Rec.	For.	Refuge & Pub. Hunting	Acquisition	Development	
Des Moines	Chautauqua Park	5	X			2,500	no est.	CCB
"	Route 99 Rest Stop	30	X			7,500	"	CCB
"	Franklin Township Lake Site	855	X			261,200	750,000	CCB
	Subbasin Total	890	3	-	-	271,200	750,000	
Number of sites in subbasin = 3								
	BASIN TOTAL	20,208	32	1	14	6,183,511	3,568,976	
Total number of sites in Basin = 47								

APPENDIX D-4

PROPOSED RECREATION AREAS
(Based on Regional & County Plans)
Iowa-Cedar Rivers Basin

Location: County	Location: Stream or Road	Name or Type of Site	Acreage: Land	Acreage: Water	Comments
Washington	English R.	County-Local Park	15	no est.	Recreational, also a rest stop
	Iowa R.	" -Specialized Pk.	no est	"	
	"	County-wide Park	"	"	Boat Access and Natural Area
	Hiway 92 & 218	Road Side Rest Stop	"	"	Plan to develop timbered areas
	Hiway 22 & 81	County-Wide Park	"	"	Plan to develop timbered areas
Tama	Bennett Creek	County Park 'B'	"	"	Boat launch, Camping, Picnicking
	Iowa R.	County Park 'A'	"	"	Boat Access, Camping, Picnicking
	Otter Creek	County Lake	280[land & water]		
Franklin * [Expansion & Development]	Baileye Creek	Sheffield Game Mgt. Area	no est.	no est.	Shoreline Development
	Baileye "	Galvin Mem. Park	"	low level dam	Wooded area proposed for overflow
	Otter Creek	WKW Park	"	no est.	Expansion of facilities
	Cedar River	West Fork Access	100	"	Expanded Wildlife Habitat
	Maynes Creek	Mallory Mem. Park	70	"	Acquisition involves additional stream side property varying from open to dense woods
	Iowa River	Pope Joy Cons. Park	no est.	low level dam	
Hardin	Iowa R. & U.S.20	Possible Park Area	25	no est.	Roadside Park } 12% of County's wooded acreage will be included
	" & County F.	" Picnic Area	40	"	" "
	Iowa R.	Addition to Eagle City Park	40	"	camping, picnic playfields, hiking.
	Iowa R. & Co. P.	Dev. of Abandoned Gravel Pit	10	"	swimming & fishing

* Commercial expansion will be along highway 65 and new Interstate 35
New Industrial Park along highway #3 and I 35

Appendix D-4 (Continued)

Location		Name or	Acreage		Comments
County	Stream or Road	Type of Site	Land	Water	
Hardin	Iowa R. & Co. A	Addition to Long Mem Park	25	no est.	Expansion (12 % of County's wooded acreage will be included)
	S. Fk. Iowa R. & State 359	Addition to Flowing Well Park	165	"	"
	S. Fk. Iowa R. & County Road	Addition to Gehrke Marsh	145	"	"
	Honey Cr. & Co.M	Addition to Reece Memorial Park	25	"	"
	County-wide	Development of Scenic Drive	no est.	"	
* Grundy	Wolf Cr. & Co. V	Wolf Cr. Rec. Area Addition	75	"	Additional parking shelters, landscaping
	Black Hawk Cr.	Co. Wide Parks Southeast	75	"	Water-related activities - wooded areas will be used for green belt
	Middle Fk. Beaver Creek	Vicinity of Buck Grove	100	"	Same as above
Linn Metropolitan Area Priority 'A' 1971 -1973	Cedar River	Squaw Cr. Green Belt	100	"	Proposed to be acquired & improved
	"	Vinton Ditch	49	"	" " " " "
	Indian Creek	Indian Cr. Green "	822	"	" " " " "
	Cedar R.	Cedar R. Green Belt	444	"	" " " " "
	-	St. Patricks	3	"	" " " " "
	Highway 150	Tucker	5	"	" " " " "

* County wants to develop green belts along wooded segments of the creeks.

Appendix D-4 (Continued)

Location		Name or	Acreage		
County	Stream or Road	Type of Site	Land	Water	Comments
Linn (con'd)	Indian Creek	Boyson	42	no est.	Proposed to be acquired
	" "	Donnelly	1.5	"	" " " "
	" "	Lininger	12	"	" " " "
		Broderick	0.83	"	" " " "
	Indian "	Hennessey	3.5	"	" " " "
Metro Area Priority 'B' 1974 - 1976	North Central Co	Dry Creek	1000	"	Proposed to be acquired & Improved
	Around edge city limits	5 unnamed areas	70	"	" " " " "
		Linn Mar	8	"	Proposed to be acquired
		Carriage Hills	10	"	" " " "
	Indian Creek	Indian Creek	25	"	" " " "
Rural Towns & Municipalities		2 unnamed areas	60	"	" " " " & Improved
Metro Area Priority 'C' 1977 - 1980		N. Cedar R. Green Belt	300	"	" " " " "
		3 unnamed areas	26	"	Proposed to be improved
	N. Central Co.	Dry Cr. Green Belt	115	"	" " " Acquired
	Prairie Cr.	Prairie Cr. Green Belt	160	"	" " " "
	NE Corner of Co.	North Central	10	"	" " " "
		Granger's Pasture	45	"	" " " "
		Southwest	10	"	" " " "
	Off S. 11th St.	Grand Ave.	15	"	" " " "
Rural Towns		Unnamed	10	"	" " " " & Improved

Appendix D-4 (Continued)

Location		Name or	Acreage		
County	Stream or Road	Type of Site	Land	Water	Comments
Johnson	Co. Rd. N.	Co. Park Graham Twp.	no est.	no est.	Wide variety, wooded area
	Old Mans Cr. & Highway 1	Co. Park Union Twp.	"	"	Variety & golf
	Iowa River	Co. Park Liberty Twp.	"	"	Variety & hunting
	River Junction & Iowa River	Co. Park Fremont Twp.	"	"	Variety & canoe landing point
	Hiway 1 & Old Mans Creek	Co. Park Washington"	"	"	Good stand of timber
	Iowa R. Crossing	Co. Park Hills Area	"	"	Good boating & possible hunting
	Cedar River	Co. Park Cedar Twp.	"	"	Access to River and Canoe route beginning Point
Mitchell		No new sites, but have a program to develop (6) and expand existing sites			
Cerro Gordo	Shell Rock R.	White Wildlife Area	90	no est.	Expansion of existing facilities
	" " "	Wikerson Pioneer Park	no est.	"	General recreation
	" " "	Rippen Park	"	"	Retain undeveloped as a preserve
	" " "	Shell Rock R. Pres.	160	"	Expansion of land area
	Winnebago R.	Clay Bank's Forest	1 mile trails	"	Expansion of land, retain in natural condition
	" "	Avery Park	20	"	Expansion of land for gen. recreation
	Road E & US 65	Linn Grove Park	no est.	"	Expansion of land for picnic & camping
	At Pleasant Valley	Ingebretson Park	"	"	Picnicking

Appendix D-4 (Continued)

Location		Name or	Acreage		
County	Stream or Road	Type of Site	Land	Water	Comments
Cerro Gordo	Winnebago R.	Kuhn Area	40	no est.	Expansion for general recreation
	Willow Creek	Willow Cr. Preserve	200	"	Top priority for preserving natural environment
	N. Dougherty on J	Coldwater Cr. Pres.	no est.	"	Water & public land preservation
Freeborn (Minn)	Bear Lake	Bear Lake Park	400	400	Multiple use for County Park
	Freeborn Lake	Freeborn Lake Park	115	no est.	County Park development
	Geneva Lake	Geneva Lake, (West) Park	135	"	Can be developed for gen. recreation
	" "	Geneva Lake, (East) Pk.	45	"	Can be developed for County Park
	Lower Twin Lake	Lower Twin Lake Park	160	"	" " " " " "
	Pickerel Lake	Pickeral Lake Park	400	no est.	Future recreation development
	Albert Lea Lake	Shell Rock R. Park	275	"	Lake & River Access Areas
	Turtle	Turtle Cr. Park	80	"	Can be developed for Picnic Camp
	Bancroft Cr.	Bancroft	645	"	Potential Wildlife Areas
	US 69	Church-Twin Lakes	1,500	"	" " "
	Goose Cr.	Goose Creek	1,525	"	" " "
	Goose Lake	Goose Lake	310	"	" " "
		Shell Rock River	850	"	" " "
		Open Space Edgewater to Helmer Myre St.PK.	no est.	"	Preservation of shoreline Albert Lea Lake
		Access on Albert Lea Lake	"	"	In conjunction with Helmer Myre State Pk.
		Access on Bear Lake	"	"	Expansion
		Access " Fountain L.	"	"	W. Side of Lake near CSAH 13
		" " Freeborn L.	"	"	In conjunction with County Park
		" " Geneva Lake	"	"	" " " Geneva Co. Park
		" " Pickeral L.	"	"	Expansion of County Park

Appendix D-4 (Continued)

Location		Name or	Acreage		Comments
County	Stream or Road	Type of Site	Land	Water	
Freeborn(cont'd)					
	Near US 69	Access on State Line Lake	no est.	no est.	Expansion of County Park
		Albert Lea Lake Over-look	9	"	South side of Lake off Co. Road 19
		Fountain Lake Over-look	no est.	"	Overlook, picnic & rest area
		Freeman Twp. Roadside Area	75	"	Rest & Picnic Area
		Minnesota Total	1,610		

APPENDIX D-5

SOIL LIMITATIONS FOR RECREATIONAL DEVELOPMENT

Iowa-Cedar Rivers Basin

Soil Associations *	% Total Acres	Foundations for Low Buildings	Septic Tank Disposal Fields	Cottages & Utility Buildings	Intensive Camp Sites	Picnic Areas	Intensive Play Areas	Paths and Trails	Golf Fairways	Estimated Suitability for Trees: Upland Hardwoods	Estimated Suitability for Trees: Conifers	Estimated Suitability for Trees: Cottonwoods
#1												
Colo	40	Severe	Severe	Severe	Severe	Moderate-Severe	Moderate-Severe	Moderate	Moderate	Low	Low	Moderate-High
Spillville	40	Severe	Severe	Moderate-Severe	Moderate-Severe	Moderate	Moderate-Severe	Moderate-Severe	Slight-Moderate	Low	Low	Moderately high-High
Waukee	20	Slight	Slight-Moderate	Slight	Slight-Moderate	Slight-Moderate	Slight-Severe	Slight	Slight	High	High	High
#2												
Saudee	30	Slight	Slight-Moderate	Slight	Slight-Moderate	Slight-Severe	Slight-Severe	Slight	Slight	Moderately high	Moderately high	Moderately high
Marshan	30	Severe	Severe	Severe	Severe	Severe	Severe	Severe	Severe	Low	Low	Moderately high
Lawler	30	Moderate	Moderate	Slight-Moderate	Slight-Moderate	Slight-Moderate	Slight-Moderate	Slight-Moderate	Slight-Moderate	Moderately high	Moderately high	High
#3												
Mahaska	50	Moderate	Moderate-Severe	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderately high	High	High
Taintor	30	Moderate	Severe	Severe	Severe	Severe	Severe	Severe	Severe	Low	Low	Moderate-High
Otley	20	Moderate	Moderate	Slight-Moderate	Slight-Moderate	Slight-Moderate	Moderate-Severe	Slight-Moderate	Slight	Very high	Very high	Very high
#4												
Otley	25	Moderate	Moderate	Slight-Moderate	Slight-Moderate	Slight-Moderate	Moderate-Severe	Slight Moderate	Slight	Very high	Very high	Very high
Ladoga	25	Moderate	Moderate	Slight-Moderate	Slight-Severe	Slight-Severe	Moderate-Severe	Slight-Moderate	Slight	Very high-High	Very high-High	Very high-High
Adair	25	Severe	Severe	Moderate	Moderate	Moderate	Severe	Moderate	Moderate	Low	Moderate	Moderate
Shelby	25	Slight	Severe	Slight-Severe	Slight-Severe	Slight-Severe	Severe	Slight-Moderate	Slight-Moderate	Moderate-High	Moderate-High	High

* The soil association numbers correspond with those on Figure II-5, Soil Association Map.

Soil Associations *	% Total Acres	Foundations for Low Buildings	Septic Tank Disposal Fields	Cottages & Utility Buildings	Intensive Camp Sites	Picnic Areas	Intensive Play Areas	Paths and Trails	Golf Fairways	Estimated Suitability for Trees		
										Upland Hardwoods	Conifers	Cottonwoods
#5												
Clinton	20	Moderate	Moderate-Severe	Slight-Severe	Slight-Severe	Slight-Severe	Moderate-Severe	Slight-Moderate	Slight-Moderate	Very high	Very high	Very high
Lindley	30	Slight	Severe	Moderate-Severe	Slight-Severe	Slight-Severe	Severe	Slight-Severe	Slight-Moderate	Migh-Moderate	Very high-Moderately high	Very high-Moderately high
Ladoga	25	Moderate	Moderate	Slight-Moderate	Slight-Severe	Slight-Severe	Moderate-Severe	Slight-Moderate	Slight	Very high-High	Very high-High	Very high-High
Keswick	25	Severe	Severe	Moderate-Severe	Moderate-Severe	Moderate Severe	Severe	Moderate	Moderate	Low	Moderate	Moderate
#6												
Fayette	30	Moderate	Slight-Severe	Slight-Severe	Slight-Severe	Slight-Severe	Slight-Severe	Slight-Moderate	Slight-Moderate	Very high	Very high	Very high
Downs	30	Moderate	Slight-Severe	Slight-Severe	Slight-Severe	Slight-Severe	Slight-Severe	Slight-Moderate	Slight-Moderate	Very high-High	Very high-High	Very high-High
Lindley	30	Slight	Moderate-Severe	Slight-Severe	Slight-Severe	Slight-Severe	Severe	Slight-Severe	Slight-Moderate	High-Moderate	Very high-Moderately high	Very high-Moderately high
#7												
Muscatine	50	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Slight	Moderate-High	Moderate-High	High
Atterberry	25	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate-High	Moderate-High	High
Tama	25	Moderate	Slight-Severe	Slight-Moderate	Slight-Severe	Slight-Moderate	Slight-Severe	Slight	Slight	Very high	Very high	Very high
#8												
Klinger	30	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Slight-Moderate	Moderate-High	Moderate-High	High
Franklin	30	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Slight	Moderate-High	Moderate-High	High
Dinsdale	30	Slight	Slight	Slight-Moderate	Slight-Moderate	Slight-Moderate	Slight-Moderate	Slight	Slight	Very high	Very high	Very high
#9												
Tama	30	Moderate	Slight-Severe	Slight-Moderate	Slight-Severe	Slight-Moderate	Slight-Severe	Slight	Slight	Very high	Very high	Very high
Downs	30	Moderate	Slight-Severe	Slight-Severe	Slight-Severe	Slight-Moderate	Slight-Severe	Slight-Moderate	Slight-Moderate	Very high-High	Very high-High	Very high-High
Shelby	20	Slight	Severe	Slight-Severe	Slight-Severe	Slight-Severe	Severe	Slight-Moderate	Slight-Moderate	Moderate-High	Moderate-High	High
Adair	20	Severe	Severe	Moderate	Moderate	Moderate	Severe	Moderate	Moderate	Low	Moderate	Moderate

* The soil association numbers correspond with those on Figure II-5, Soil Association Map.

Soil Associations*	% Total Acres	Foundations for Low Buildings	Septic Tank Disposal Fields	Cottages & Utility Buildings	Intensive Camp Sites	Picnic Areas	Intensive Play Areas	Paths and Trails	Golf Fairways	Estimated Suitability for Trees: Upland Hardwoods	Estimated Suitability for Trees: Conifers	Estimated Suitability for Trees: Cottonwoods
#10												
Tama	40	Moderate	Slight-Severe	Slight-Moderate	Slight-Severe	Slight-Moderate	Slight-Severe	Slight	Slight	Very high	Very high	Very high
Dinsdale	30	Slight	Slight	Slight-Moderate	Slight-Moderate	Slight-Moderate	Slight-Moderate	Slight	Slight	Very high	Very high	Very high
Kenyon	15	Slight	Moderate-Severe	Slight-Moderate	Slight-Moderate	Slight-Moderate	Slight-Severe	Slight	Slight	High	High	Very high
Klinger	15	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Slight-Moderate	Moderate-High	Moderate-High	High
#11												
Dinsdale	25	Slight	Slight	Slight-Moderate	Slight-Moderate	Slight-Moderate	Slight-Moderate	Slight	Slight	Very high	Very high	Very high
Aredale	25	Slight	Moderate	Slight	Slight	Slight	Slight	Slight	Slight	High	High	Very high
Kenyon	25	Slight	Moderate-Severe	Slight-Moderate	Slight-Moderate	Slight-Moderate	Slight-Moderate	Slight	Slight	High	High	Very high
Tama	25	Moderate	Slight-Severe	Slight-Moderate	Slight-Severe	Slight-Moderate	Slight-Severe	Slight	Slight	Very high	Very high	Very high
#12												
Readlyn	30	Moderate	Moderate-Severe	Moderate	Moderate	Moderate	Moderate	Moderate	Slight	Moderately high	Moderately high	High
Maxfield	20	Severe	Severe	Severe	Severe	Moderate-Severe	Moderate-Severe	Moderate	Moderate	Low	Low	Moderately high
Tripoli	30	Moderate	Severe	Severe	Severe	Severe	Severe	Severe	Severe	Low	Low	Moderately high
Klinger	20	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Slight-Mod.	Moderately high	Moderately high	High
#13												
Kenyon	40	Slight	Moderate-Severe	Slight-Moderate	Slight-Moderate	Slight-Moderate	Slight-Severe	Slight	Slight	High	High	Very high
Floyd	25	Moderate-Severe	Severe	Moderate	Moderate-Severe	Moderate-Severe	Moderate-Severe	Moderate	Moderate	Moderate-High	Moderately high	High
Clyde	20	Severe	Severe	Severe	Severe	Severe	Severe	Severe	Severe	Low	Low	Moderately high
Schley	15	Moderate-Severe	Severe	Moderate	Moderate-Severe	Moderate-Severe	Moderate-Severe	Moderate	Moderate	Moderately high	Moderately high	High

* The soil association numbers correspond with those on Figure II-5, Soil Association Map.

Soil Associations*	% Total Acres	Foundations for Low Buildings	Septic Tank Disposal Fields	Cottages & Utility Buildings	Intensive Camp Sites	Picnic Areas	Intensive Play Areas	Paths and Trails	Golf Fairways	Estimated Suitability for Trees: Upland Hardwoods	Conifers	Cottonwoods
#14												
Kenyon	50	Slight	Moderate-Severe	Slight-Moderate	Slight-Moderate	Slight-Moderate	Slight-Severe	Slight	Slight	High	High	Very high
Racine	25	Slight	Slight-Severe	Slight-Moderate	Slight-Severe	Slight-Severe	Slight-Severe	Slight-Moderate	Slight-Moderate	High	High	Very high
Coggon	25	Slight	Moderate	Moderate-Severe	Slight-Moderate	Slight-Moderate	Slight-Moderate	Slight-Moderate	Slight-Moderate	High	High	Very high
#15												
Webster	50	Severe	Severe	Severe	Severe	Severe	Severe	Severe	Severe	Low	Low	Moderate-High
Nicollet	25	Moderate	Moderate	Slight-Moderate	Moderate	Moderate	Moderate	Slight	Slight	Moderately high	Moderately high	High
Clarion	20	Slight	Slight	Slight	Slight	Slight	Slight	Slight	Slight	High	High	Very high
Harps	5	Severe	Severe	Severe	Severe	Severe	Severe	Severe	Severe	Low	Low	Moderate-High
#16												
Clarion	50	Slight	Slight	Slight	Slight	Slight	Slight	Slight	Slight	High	High	Very high
Nicollet	25	Moderate	Moderate	Slight-Moderate	Moderate	Moderate	Moderate	Slight	Slight	Moderate-High	Moderately high	High
Lester	20	Slight	Slight	Slight-Severe	Slight-Severe	Slight-Severe	Moderate-Severe	Slight-Severe	Slight-Severe	High-Moderately high	High-Moderately high	Very high-High
Okoboji	5	Severe	Severe	Severe	Severe	Severe	Severe	Severe	Severe	Low	Low	Moderate-High
#17												
Lester	50	Slight	Slight	Slight-Severe	Slight-Severe	Slight-Severe	Moderate-Severe	Slight-Severe	Slight-Severe	High-Moderately high	High-Moderately high	Very high-High
Clarion	10	Slight	Slight	Slight	Slight	Slight	Slight	Slight	Slight	High	High	Very high
Hayden	40	Slight	Slight	Slight-Severe	Slight-Severe	Slight-Severe	Moderate-Severe	Slight-Severe	Slight-Severe	High-Moderately high	High-Moderately high	High
Glencoe	10	Severe	Severe	Severe	Severe	Severe	Severe	Severe	Severe	-	-	Moderate

* The soil association numbers correspond with those on Figure II-5, Soil Association Map.

Soil Associations*	% Total Acres	Foundations for Low Buildings	Septic Tank Disposal Fields	Cottages & Utility Buildings	Intensive Camp Sites	Picnic Areas	Intensive Play Areas	Paths and Trails	Golf Fairways	Estimated Suitability for Trees: Upland Hardwoods	Estimated Suitability for Trees: Conifers	Estimated Suitability for Trees: Cottonwoods
#18												
Rockton	45	Slight	Severe	Slight-Moderate	Slight-Moderate	Slight-Moderate	Moderate-Severe	Slight	Slight	Moderately high	Moderately high	Moderately high
Dodgeville	45	Slight	Moderate-Severe	Slight Moderate	Slight Moderate	Slight Moderate	Moderate Severe	Slight	Slight	High	High	High
Sogn	10	Slight	Very severe	Severe	Severe	Severe	Severe	Moderate-Severe	Severe	Low	Low	Low
#19												
Cresco	50	Slight	Severe	Slight-Moderate	Slight-Moderate	Slight-Moderate	Slight-Severe	Slight-Moderate	Slight	Moderate	Moderate-High	High
Lourdes	50	Slight	Severe	Slight-Moderate	Slight-Moderate	Slight-Moderate	Slight-Severe	Slight	Slight	Moderately high	Moderately high	High
#20												
Chelsea	25	Slight	Slight	Slight	Moderate	Moderate	Severe	Severe	Severe	Moderate	Moderately high	Moderately high
Sparta	25	Slight	Slight	Slight-Severe	Moderate-Severe	Moderate-Severe	Moderate-Severe	Moderate-Severe	Severe	Moderate	Moderately high	Moderately high
Dickinson	25	Slight	Slight	Slight-Moderate	Slight-Moderate	Slight-Moderate	Slight-Moderate	Slight-Moderate	Slight-Moderate	Moderate-High	Moderate-High	Moderate-High
Fayette	25	Moderate	Slight-Severe	Slight-Severe	Slight-Severe	Slight-Severe	Slight-Severe	Slight-Moderate	Slight-Moderate	Very high-High	Very high-High	Very high-High
#21												
Moland		Moderate	Moderate	Moderate	Slight	Slight	Moderate	Slight	Slight	-	-	-
Merton		Moderate	Moderate	Moderate	Slight	Slight	Slight	Slight	Slight	-	-	-
Maxcreek		Severe	Severe	Severe	Severe	Severe	Severe	Severe	Severe	-	-	-
#22												
Kilkenny		Moderate	Severe	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	-	-	-
Lerdal		Moderate	Severe	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	-	-	-
Hanel		Severe	Severe	Severe	Severe	Severe	Severe	Severe	Severe	-	-	-
#23												
Colo	30	Severe	Severe	Severe	Severe	Moderate-Severe	Moderate Severe	Moderate	Moderate	Low	Low	Moderate-High
Biscay	30	Severe	Severe	Severe	Severe	Severe	Severe	Severe	Severe	Low	Low	Moderate-High
Estherville	30	Slight	Slight-Severe	Slight-Moderate	Slight-Severe	Slight-Moderate	Moderate-Severe	Slight-Moderate	Moderate	Moderate	Moderately high	Moderately high

* The soil association numbers correspond with those on Figure II-5, Soil Association Map.

DRAINAGE

Iowa-Cedar Rivers Basin

As part of the Iowa-Cedar Rivers Basin study, the Soil Conservation Service inventoried the legal drainage districts using tile mains as major outlets. Only the upper areas of the Iowa and Cedar Rivers subbasins and all the area of the Shell Rock River and the West Fork Cedar River subbasins were reviewed. Very few legal drainage districts utilizing tile mains exist in the remainder of the Basin.

There were 528 legal districts with a total area of 611,290 acres inventoried. These range in size from 80 to 6,600 acres with an average size of 1,160 acres. The maximum tile main size was 48 inches in diameter with many from 30 to 48 inches. Most of these systems inventoried were installed between 1906 and 1920.

Relating the plan of records maintained by county auditors to present day criteria, it can be reasonably assumed that over 50 percent of these drainage districts studied have inadequate tile main systems. Present day criteria for a high majority of the drainage systems in LRA 103 calls for a drainage coefficient of one-half inch.[1/]

The present criteria for tile main capacity listed in the "Iowa Drainage Guide"[2/] is as follows:

Drainage Coefficients of New Systems for General Field Crops

The drainage coefficient for new mains and laterals is selected according to the degree of existing surface drainage.

1. If surface inlets must be used to drain potholes when adequate surface drainage does not exist, the tile should have a capacity to remove runoff from the entire watershed area which drains toward the inlet, at the rate of one-half inch in 24 hours. This capacity should be provided whether or not the surface inlets are initially installed. An exception may be made for small potholes when surveys are available so that the volume of the potholes can be determined accurately. In this case, a tile capacity to remove three-eighths inch per 24 hours from the land area which needs tile drainage plus the capacity to remove the volume of the pothole in 24 hours is sufficient.

1/ A drainage system designed with a drainage coefficient of one-half inch has capacity to remove one-half inch of water from the entire drainage area during a 24-hour period.

2/ "Iowa Drainage Guide", Special Report #13 (Rev.) Iowa State University, Ames, Iowa - December 1962.

2. If adequate surface drainage exists naturally or has been constructed to drain depressed areas, the tile should have a capacity to remove tile drainage water from only the area within the watershed which needs tile drainage at the rate of three-eighths inch per 24 hours.

3. For areas where no ponding exists but surface drainage is limited, capacity should be provided for the area needing tile drainage at the rate of one-half inch per 24 hours.

About 82 percent (434) of the legal drainage districts inventoried are located in LRA (Land Resource Area) 103. Item 1 listed above is applicable for a majority of the drainage districts located in LRA 103 which includes the Webster-Nicollet-Clarion-Harps Soil Association. Less than ten percent of the drainage districts inventoried have capacity for one-half inch drainage coefficient. About 13 percent of the districts studied are in LRA 104 and about five percent in LRA 108. Design criteria listed in item 2 would apply to nearly all the systems in LRA 108 and many in 104. For the broad flat upland areas of LRA 104 the design criteria for capacity should meet that listed under item 3. A capacity of from one-eighth to three-sixteenths inch for the entire watershed is adequate for most drainage systems in LRA's 104 and 108. Many of the drainage districts studied in these LRA's have adequate capacity.

The time required to analyze the adequacy of these drainage systems was beyond the scope of this study. Important factors not analyzed that materially affect the adequacy of a system are as follows:

1. Condition of the tile. Many tile have been found crushed in systems as old as many of these. It is also common to find tile lines blocked or partially blocked by sand, rodents, or tree roots.

2. Actual size of the tile mains. Soil Conservation Service technicians have found that the size of tile in the ground does not always agree with the plan of record, and if not they are generally smaller.

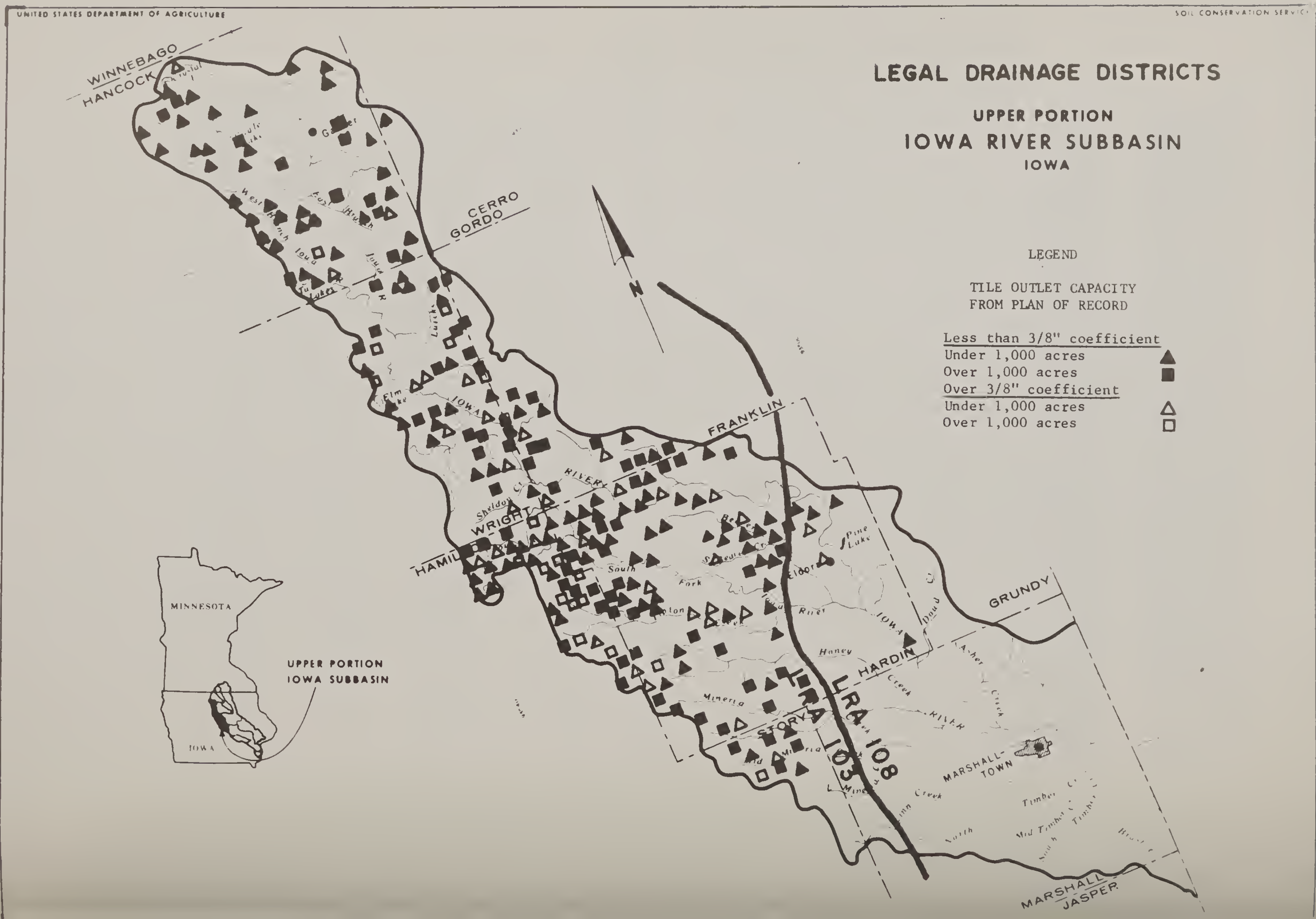
3. Poor alignment of tile and tile not laid on design grade.

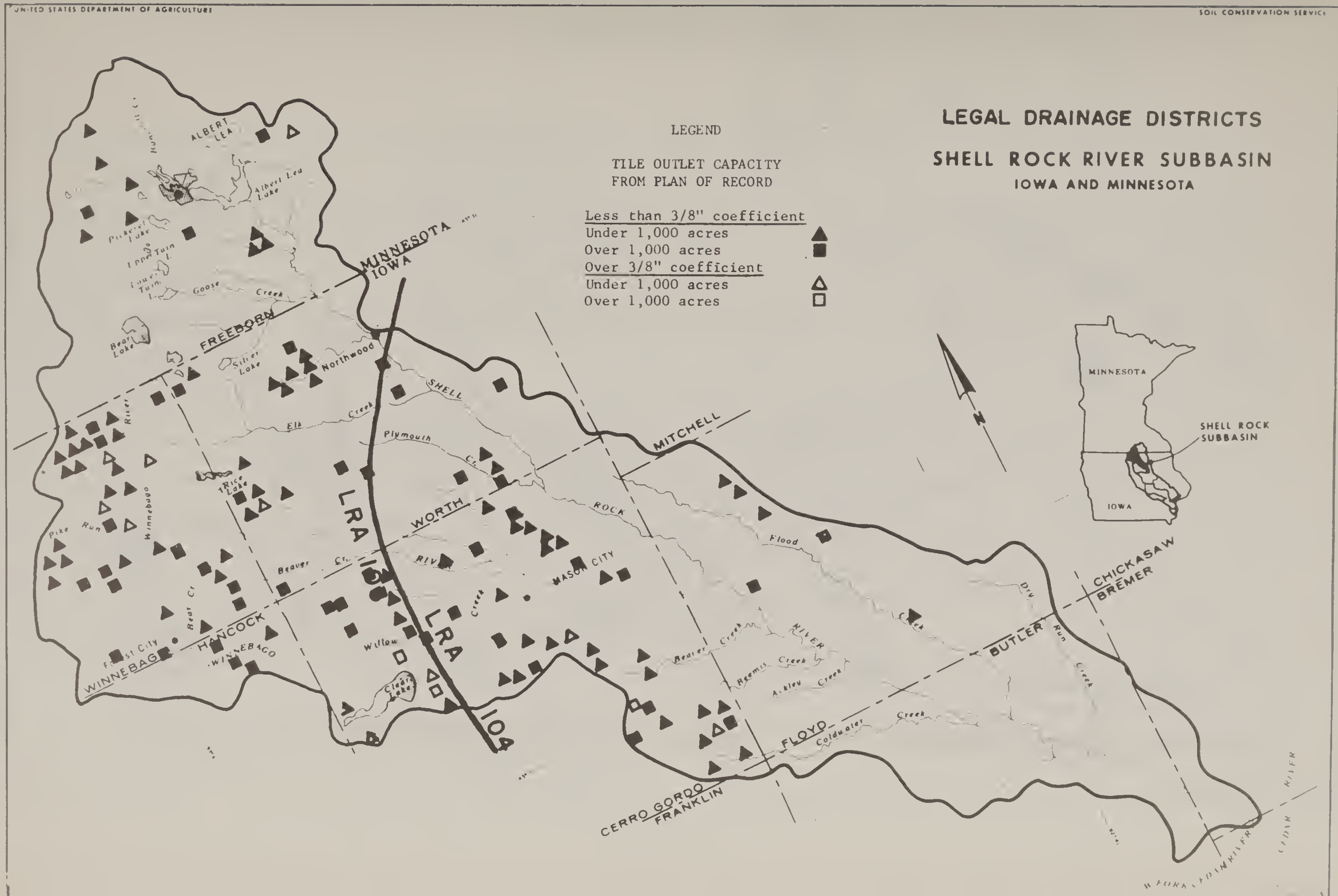
4. Adequacy of the outlets. Many do not allow free flow of water from tile mains.

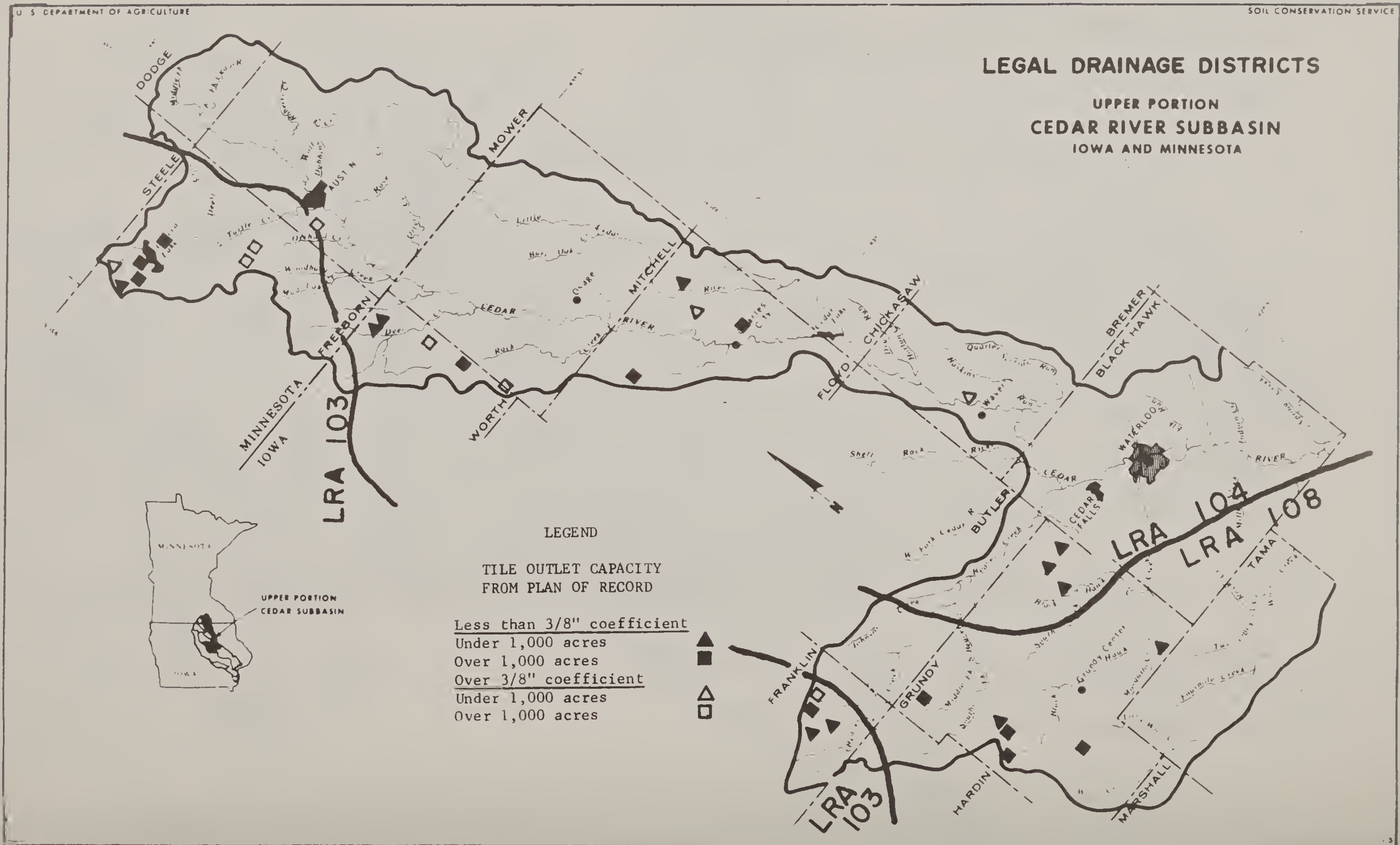
5. Adequacy of the depth of the tile mains. Tile mains may be laid too shallow to provide adequate drainage for some areas.

6. Drainage coefficient required for individual drainage districts to provide adequate capacity. The land in each district must be checked in detail to determine percent of soils needing drainage and the degree of surface drainage that is available.

The following maps are an inventory of the legal drainage districts using tile for an outlet. This study was made with the use of available county records. No attempt was made to field check the information.

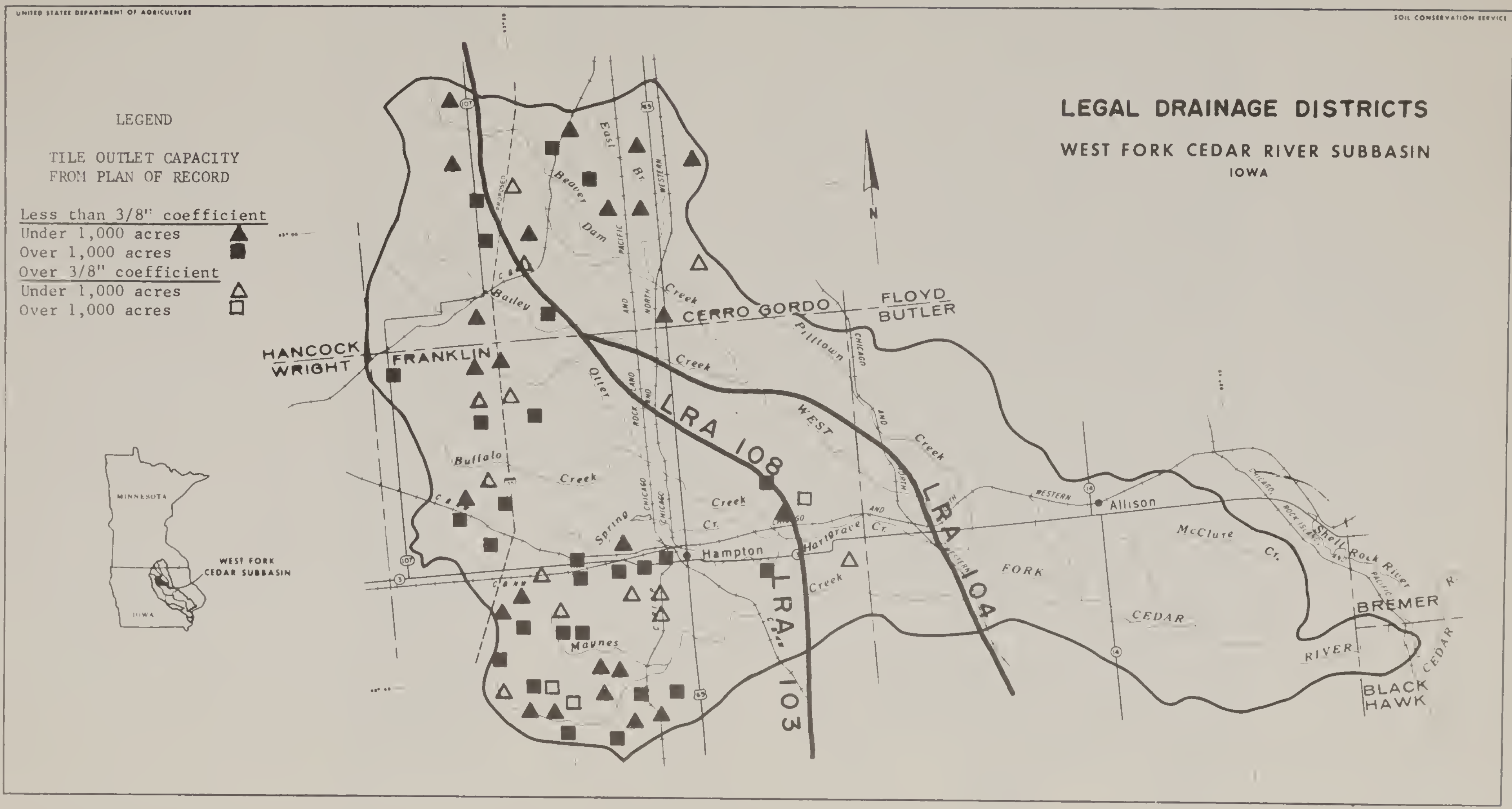

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
LEGAL DRAINAGE DISTRICTS
UPPER PORTION
IOWA RIVER SUBBASIN
IOWA
LEGEND
TILE OUTLET CAPACITY
FROM PLAN OF RECORD
Less than 3/8" coefficient
Under 1,000 acres
Over 1,000 acres
Over 3/8" coefficient
Under 1,000 acres
Over 1,000 acres
WINNEBAGO
HANCOCK
CERRO
GORDO
FRANKLIN
WRIGHT
HAMILTON
HARDIN
GRUNDY
STORY
MARSHALL
JASPER
MARSHALL-
TOWN
LRA 108
LRA 103
N
MINNESOTA
IOWA
UPPER PORTION
IOWA SUBBASIN


UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
LEGAL DRAINAGE DISTRICTS
SHELL ROCK RIVER SUBBASIN
IOWA AND MINNESOTA
LEGEND
TILE OUTLET CAPACITY
FROM PLAN OF RECORD
Less than 3/8" coefficient
Under 1,000 acres
Over 1,000 acres
Over 3/8" coefficient
Under 1,000 acres
Over 1,000 acres
MINNESOTA
IOWA
SHELL ROCK
SUBBASIN
N
ALBERT LEA
Albert Lea Lake
Pickerel Lake
Upper Twin L.
Lower Twin L.
Goose Creek
Bear Lake
Silver Lake
Northwood
FREEBORN
WORTH
MITCHELL
HANCOCK
WINNEBAGO
CERRO GORDO
FRANKLIN
FLOYD
BUTLER
CHICKASAW
BREMER
SHELL
ROCK
RIVER
Elk Creek
Plymouth Cr.
Rice Lake
Pike Run
Winnebago
Beaver Cr.
Bear Cr.
Forest City
Willow
Clear Lake
MASON CITY
Creek
Flood
Beaver Creek
Beemis Creek
Ackley Creek
Coldwater Creek
Dry Run Creek
LRA
104



U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
LEGAL DRAINAGE DISTRICTS
UPPER PORTION
CEDAR RIVER SUBBASIN
IOWA AND MINNESOTA
DODGE
STEELE
MOWER
FREEBORN
MITCHELL
WORTH
FLOYD
CHICKASAW
BREMER
BLACK HAWK
BUTLER
FRANKLIN
GRUNDY
HARDIN
MARSHALL
TAMA
MINNESOTA
IOWA
AUSTIN
WATERLOO
CEDAR FALLS
CEDAR
RIVER
Shell
Rock
LRA 103
LRA 104
LRA 108
LRA 103
N
UPPER PORTION
CEDAR SUBBASIN
LEGEND
TILE OUTLET CAPACITY
FROM PLAN OF RECORD
Less than 3/8" coefficient
Under 1,000 acres
Over 1,000 acres
Over 3/8" coefficient
Under 1,000 acres
Over 1,000 acres

Appendix E-1


UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
LEGAL DRAINAGE DISTRICTS
WEST FORK CEDAR RIVER SUBBASIN
IOWA
LEGEND
TILE OUTLET CAPACITY
FROM PLAN OF RECORD
Less than 3/8" coefficient
Under 1,000 acres
Over 1,000 acres
Over 3/8" coefficient
Under 1,000 acres
Over 1,000 acres
HANCOCK
WRIGHT
FRANKLIN
CERRO GORDO
FLOYD
BUTLER
BREMER
BLACK HAWK
LRA 108
LRA 104
LRA 103
N
Allison
Hampton
East Br.
Beaver Dam Creek
Bailey
Otter Creek
Buffalo Creek
Spring Creek
Pilltown Creek
WEST FORK CEDAR RIVER
Hartgrave Cr.
Maynes
McClure Cr.
Shell Rock River
CEDAR R.
MINNESOTA
IOWA
WEST FORK
CEDAR SUBBASIN

APPENDIX F-1

ENVIRONMENTAL CORRIDORS

Iowa-Cedar Rivers Basin

All environmental corridors cannot provide recreational resources of identical quality. Some segments of the corridors are known to be more esthetically pleasing than others. Some corridor segments are limited because of physical terrain restraints or biological inadequacies for recreational use. With this concept in mind, a joint effort was undertaken to evaluate the stream corridors comparatively with all the streams in the state and region. This evaluation rated twenty-four categories of physical biological and human use concepts. The rating system used is explained in the Environmental Corridor Reference Report. The results on this rating system showed all of the main river corridors of the basin to be average or above average compared to the state and region stream corridors. Nine of the stream corridor segments rated above average. These segments were thus chosen as areas that should be established, preserved, enhanced or managed.

The segments of corridor that have a higher rating, present a better opportunity for multiple use planning. The resources available for quality recreation, wildlife habitat and esthetic appeal are more desirable in these chosen segments of corridor than others.

These corridor segments depict favorable land use. Bottom land is the prime area for crop production. Where land conversion from forest to cropland takes place the esthetic appeal values are lowered. The favorable areas of corridors should be put under some control so they will not become abused any further. These corridors are the last remaining remnants of past wilderness or natural areas. They should be preserved or managed so the following generations can enjoy the land and water as past generations have done.

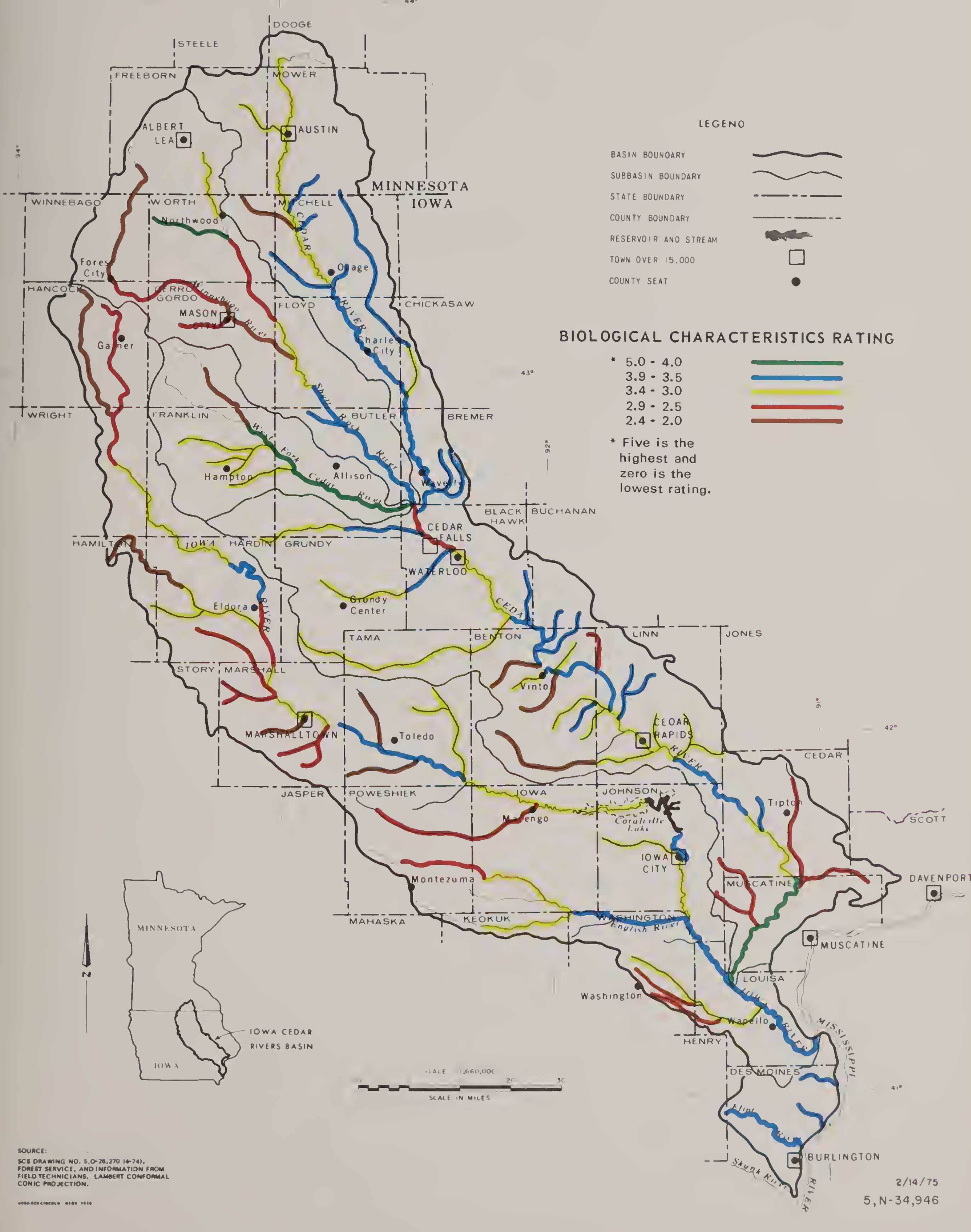
Recommendations for establishment, preservation, enhancement or management of certain segments of corridors can be made. The land use planners, sponsors and local people of the area must make the decisions concerning any land acquisition or establishment. These plans may be used in their entirety or in part, depending on the wishes and plans of the sponsors. The specific plans are explained in the Environmental Corridor Report.

U. S. DEPARTMENT OF AGRICULTURE

ENVIRONMENTAL CORRIDOR EVALUATION MAP

IOWA-CEDAR RIVERS BASIN

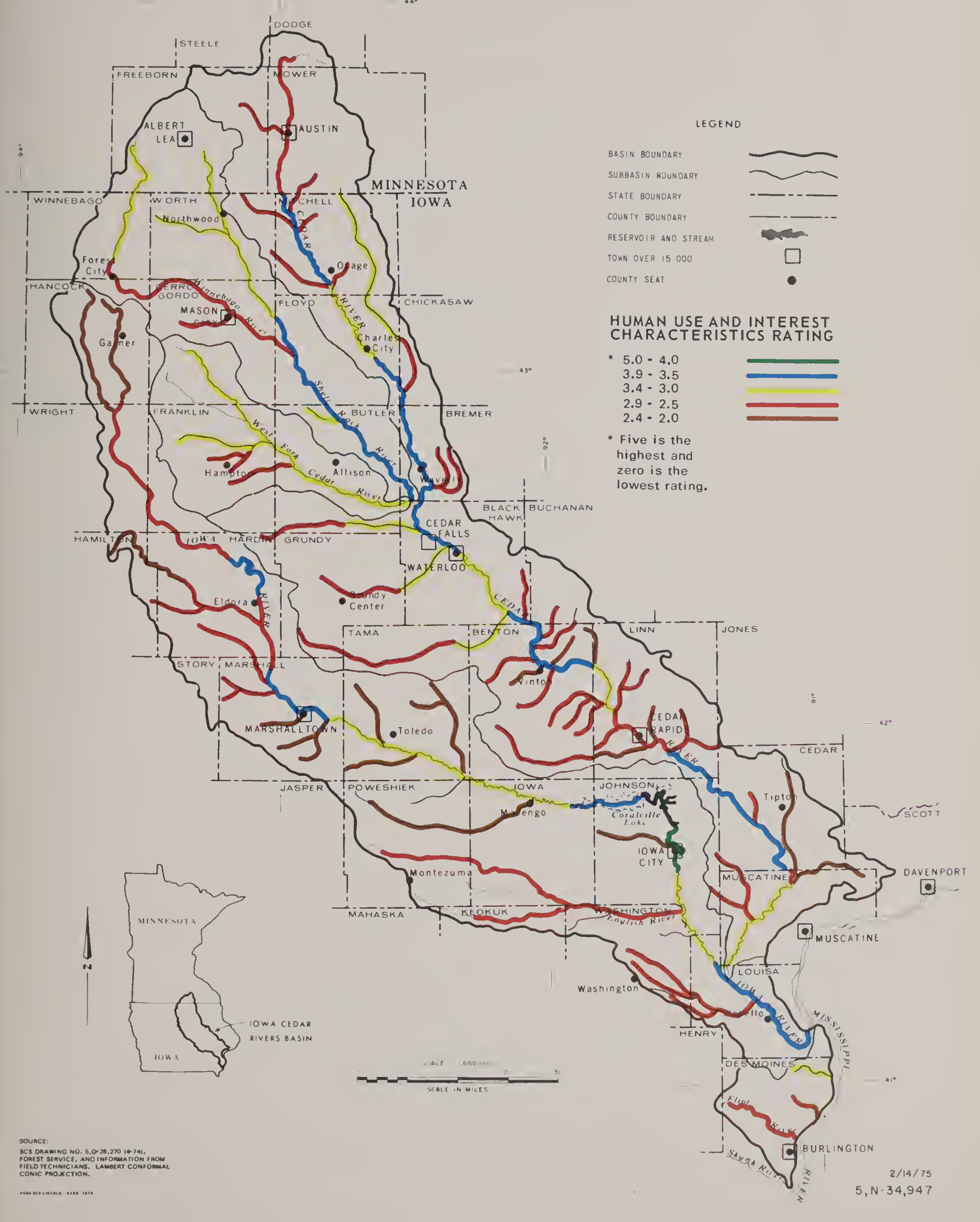
IOWA AND MINNESOTA



SOURCE:
SCS DRAWING NO. 5,O-28,270 (4-74), FOREST SERVICE, AND INFORMATION FROM FIELD TECHNICIANS. LAMBERT CONFORMAL CONIC PROJECTION.

U. S. DEPARTMENT OF AGRICULTURE

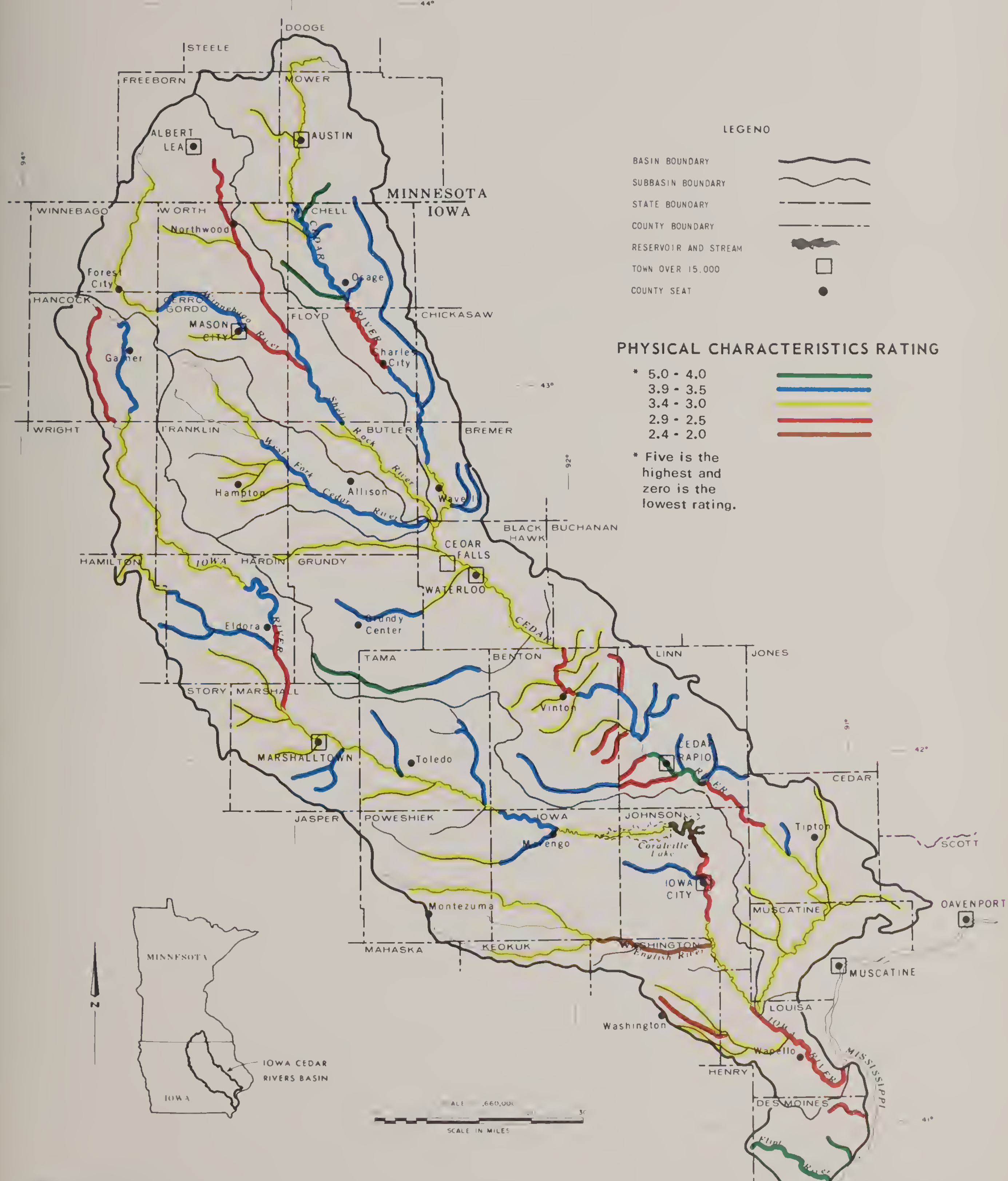
ENVIRONMENTAL CORRIDOR EVALUATION MAP
IOWA-CEDAR RIVERS BASIN
IOWA AND MINNESOTA



SOURCE:
SCS DRAWING NO. 5,O-28,270 (4-74), FOREST SERVICE, AND INFORMATION FROM FIELD TECHNICIANS. LAMBERT CONFORMAL CONIC PROJECTION.

U. S. DEPARTMENT OF AGRICULTURE

ENVIRONMENTAL CORRIDOR EVALUATION MAP
IOWA-CEDAR RIVERS BASIN
IOWA AND MINNESOTA



SOURCE:
SCS DRAWING NO. 5,O-28,270 (4-74),
FOREST SERVICE, AND INFORMATION FROM
FIELD TECHNICIANS. LAMBERT CONFORMAL
CONIC PROJECTION.

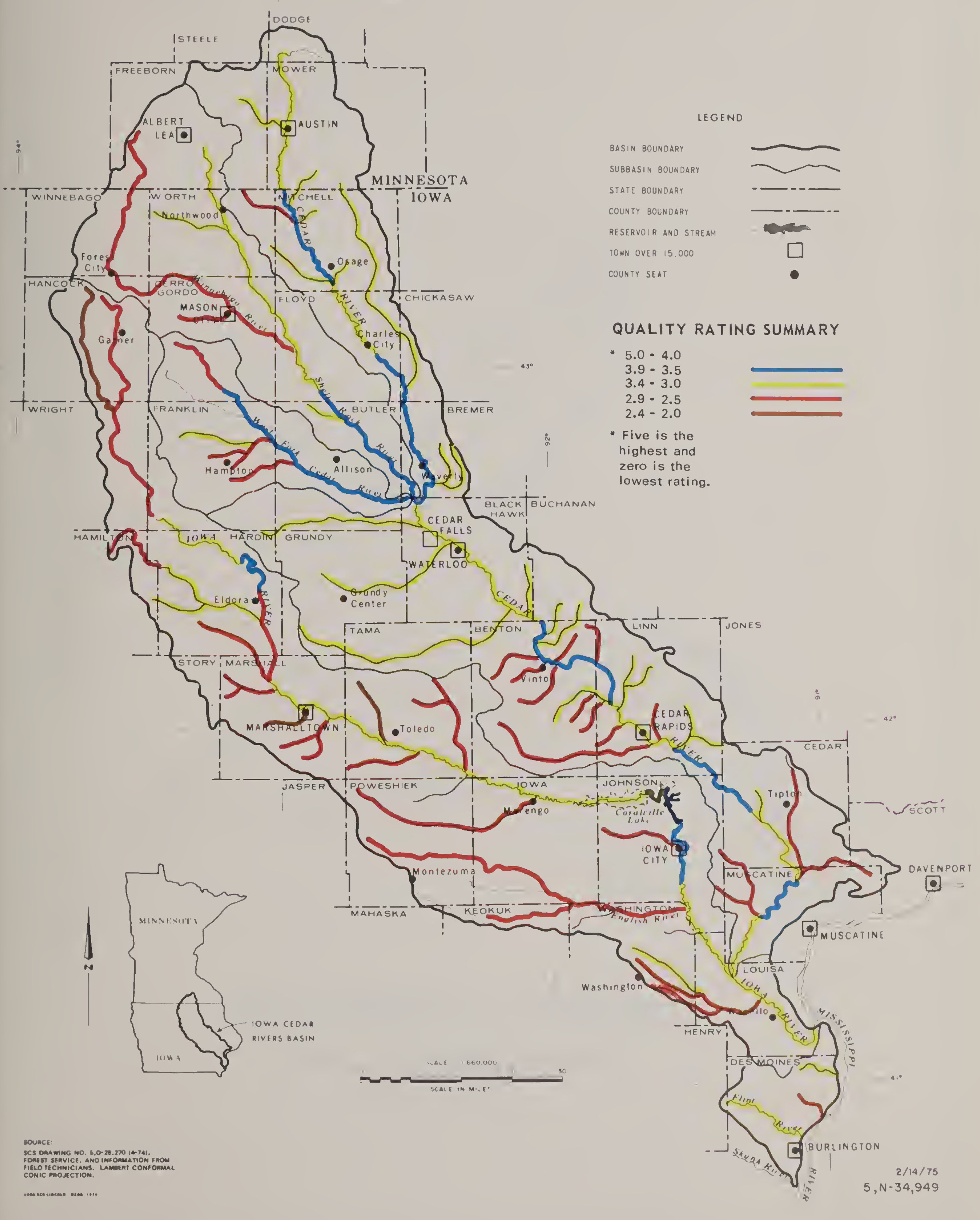
2/14/75
5,N-34,948

U S DEPARTMENT OF AGRICULTURE

ENVIRONMENTAL CORRIDOR EVALUATION MAP

IOWA-CEDAR RIVERS BASIN

IOWA AND MINNESOTA



SOURCE:
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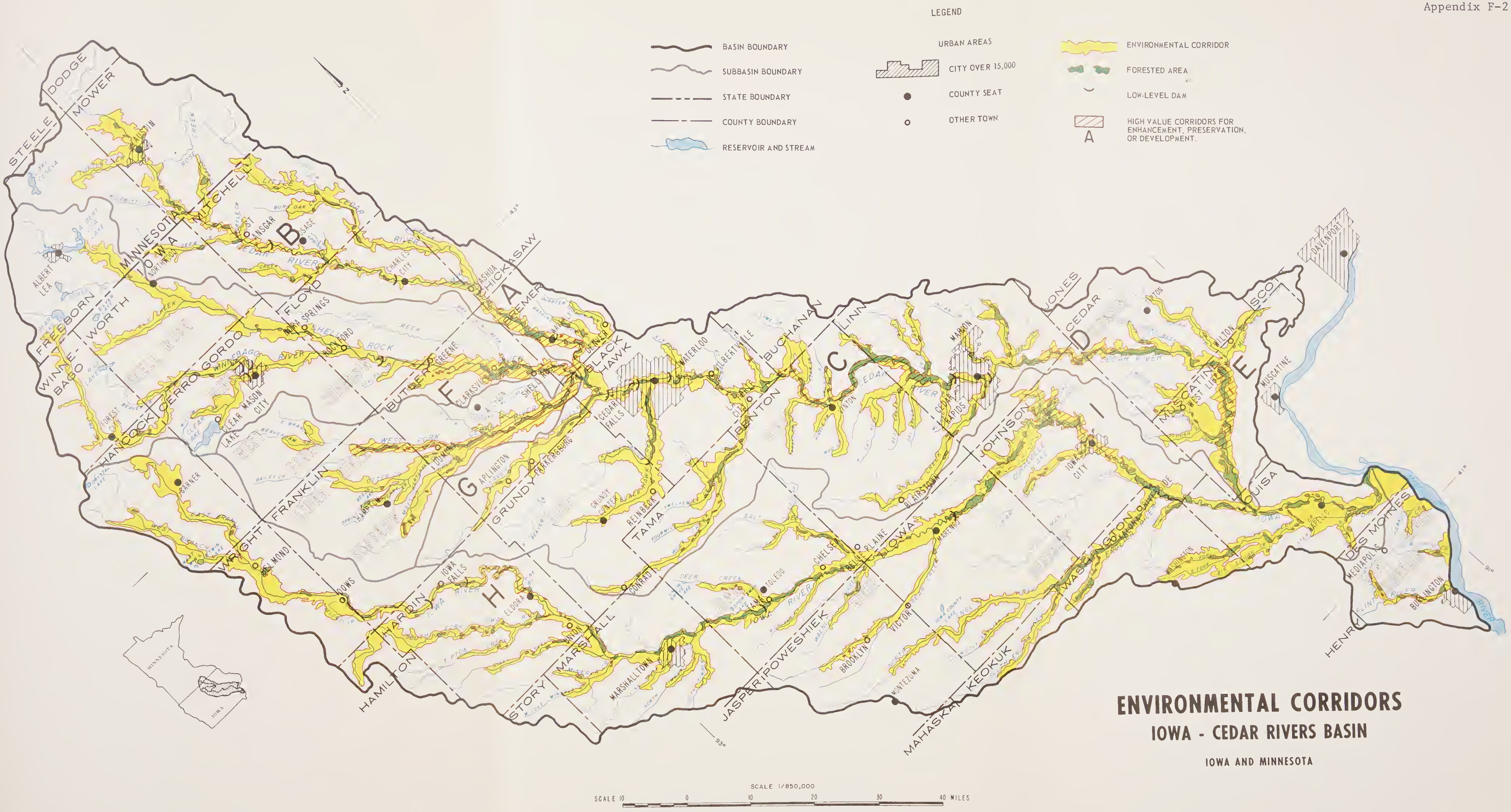
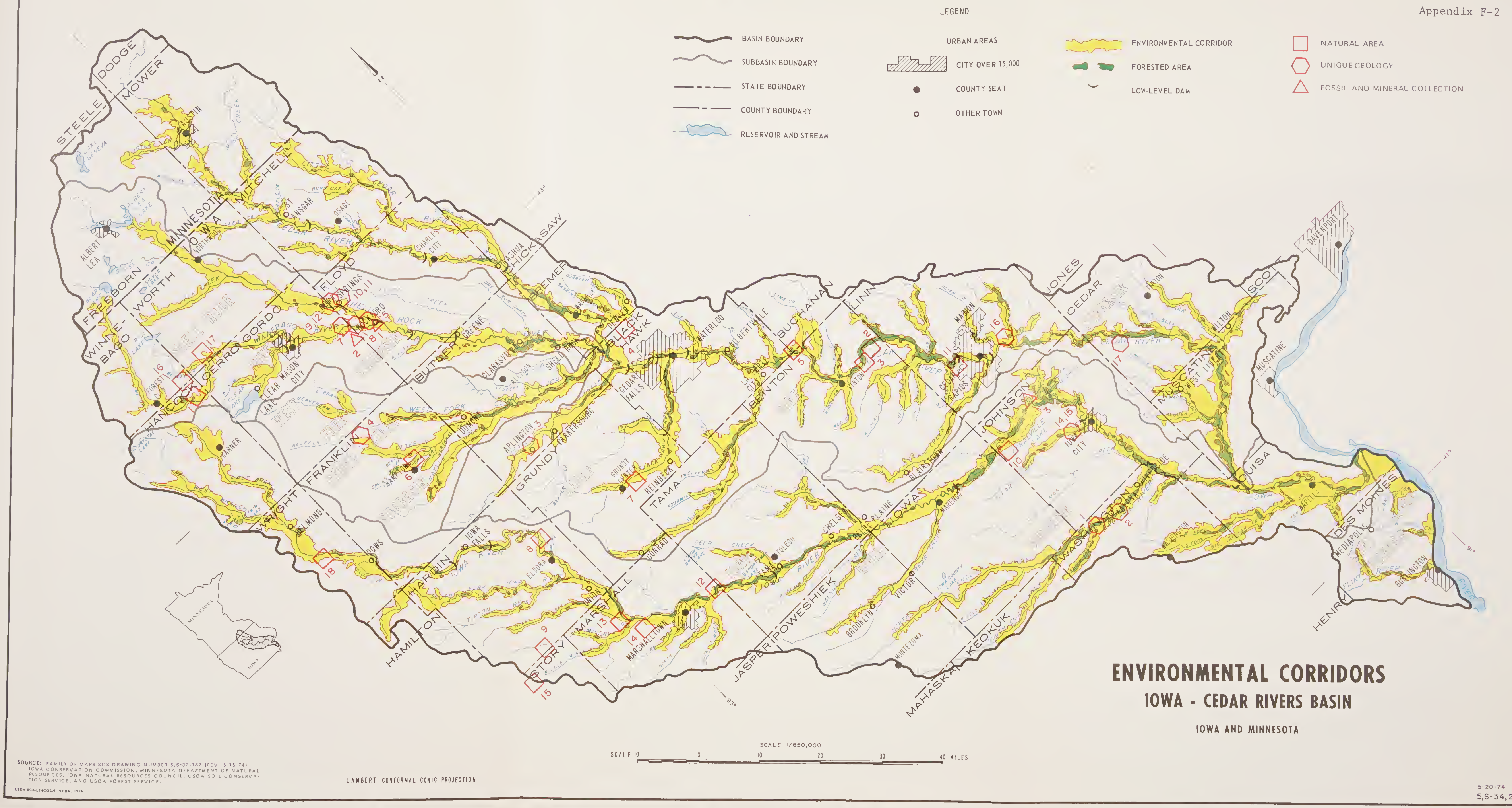


SOURCE: FAMILY OF MAPS SCS DRAWING NUMBER 5,S-32,382 (REV. 5-15-74) IOWA CONSERVATION COMMISSION, MINNESOTA DEPARTMENT OF NATURAL RESOURCES, IOWA NATURAL RESOURCES COUNCIL, USDA SOIL CONSERVATION SERVICE, AND USDA FOREST SERVICE.

LAMBERT CONFORMAL CONIC PROJECTION

USDA-SCS-LINCOLN, NEBR. 1974

5-20-74
5,S-34,250.1


LEGEND
BASIN BOUNDARY
SUBBASIN BOUNDARY
STATE BOUNDARY
COUNTY BOUNDARY
RESERVOIR AND STREAM
URBAN AREAS
CITY OVER 15,000
COUNTY SEAT
OTHER TOWN
ENVIRONMENTAL CORRIDOR
FORESTED AREA
LOW-LEVEL DAM
NATURAL AREA
UNIQUE GEOLOGY
FOSSIL AND MINERAL COLLECTION
ENVIRONMENTAL CORRIDORS
IOWA - CEDAR RIVERS BASIN
IOWA AND MINNESOTA
SCALE 1/850,000
SCALE 10 0 10 20 30 40 MILES
LAMBERT CONFORMAL CONIC PROJECTION
SOURCE: FAMILY OF MAPS SCS DRAWING NUMBER 5,S-32,382 (REV. 5-15-74)
IOWA CONSERVATION COMMISSION, MINNESOTA DEPARTMENT OF NATURAL RESOURCES, IOWA NATURAL RESOURCES COUNCIL, USDA SOIL CONSERVATION SERVICE, AND USDA FOREST SERVICE.
USDA-SCS-LINCOLN, NEBR. 1974
5-20-74
5,S-34,250.2
STEELE
DODGE
MOWER
FREEBORN
WORTH
MITCHELL
HOWARD
FLOYD
CHICKASAW
BREMER
BUTLER
FRANKLIN
CERRO GORDO
HANCOCK
WINNEBAGO
WRIGHT
HAMILTON
HARDIN
GRUNDY
BLACK HAWK
BUCHANAN
TAMA
BENTON
LINN
JONES
CEDAR
SCOTT
MUSCATINE
JOHNSON
IOWA
POWESHIEK
JASPER
MARSHALL
STORY
KEOKUK
MAHASKA
WASHINGTON
LOUISA
DES MOINES
HENRY
MINNESOTA
IOWA
ALBERT LEA
NORTHWOOD
OSAGE
CHARLES CITY
MASON CITY
CLEAR LAKE
GARNER
FOREST CITY
CLARKSVILLE
WAVERLY
WATERLOO
CEDAR FALLS
CEDAR RAPIDS
MARION
IOWA CITY
MUSCATINE
DAVENPORT
TIPTON
WEST LIBERTY
MARSHALLTOWN
TOLEDO
BROOKLYN
MONTEZUMA
BURLINGTON
MEDIAPOLIS
ELDORA
IOWA FALLS
BELMOND
DOWS
HAMPTON
GRUNDY CENTER
REINBECK
PARKERSBURG
APLINGTON
VINTON
BLAIRSTOWN
CONRAD
CEDAR RIVER
IOWA RIVER
SHELL ROCK
WEST FORK
ENGLISH
NORTH SKUNK
MISSISSIPPI RIVER

APPENDIX G-1

COMPREHENSIVE PLANS AND ANALYSES

Iowa-Cedar Rivers Basin

MINNESOTA

Water Quality Management Plan, Interim Cedar River Basin, Minnesota Pollution Control Agency, Division of Water Quality 1971.

Dodge County

1. Dodge County 1970-2000 Comprehensive County Development Plan, July 1970
2. Dodge County Population Analysis, August 1968
3. Dodge County Community Facilities, November 1968
4. Dodge County Transportation Analysis, February 1969
5. Economic Survey and Analysis, Dodge County, November 1968
6. Dodge County Housing Analysis, October 1968
7. An Appraisal of Potentials for Outdoor Recreation Developments, Dodge County, June 1970
8. Dodge County Land Use Survey and Analysis, May 1968

Freeborn County

1. Albert Lea Area Comprehensive Development and Transportation Plan, 1970
2. Comprehensive Development Plan, 1970
3. Albert Lea Park Facilities: Proposals for the Future. Material is available. The report is not formal at present time. 1973
4. Albert Lea Area Comprehensive Development and Transportation Planning Program, Basic Studies Report, 1970
5. Freeborn County: Research and Analysis Report, Comprehensive Planning Program, 1970
6. Recommended Zoning Ordinance for Freeborn County, May 1971
7. Freeborn County Comprehensive Planning Program, Comprehensive Plan Report, December 1970
8. Comprehensive Sewer and Water Plan, Freeborn County, Minnesota February 1971
9. A study of Albert Lea Lake Watershed, City of Albert Lea and Freeborn County Commissioners, 1974.

Mower County

1. Austin Area Comprehensive Development and Transportation Plan, September 1969
2. Comprehensive Development Plan, October 1970
3. Austin Park Facilities: Proposals for the Future, 1969
4. Austin Area Comprehensive Development and Transportation Planning Program, Basic Studies Report, March 1970

Appendix G-1 (Continued)

Mower County (continued)

5. Mower County: Research and Analysis Report, Comprehensive Planning Program, August 1970
6. Recommended Zoning Ordinance for Mower County, July 1970
7. Drainage Plan for Mower County, September 1973
8. Mower County Comprehensive Planning Program, Comprehensive Plan Report, December 1970
9. Comprehensive Sewer and Water Plan, Mower County, Minnesota, October 1972

IOWA

Benton County

1. Benton County Comprehensive Sewer and Water Study, 1969
2. Benton County Outdoor Recreation Plan, 1968
3. Benton County Comprehensive Plan, 1973

Black Hawk County

1. Human Resources Study, Iowa Northland Regional Council of Governments, 1973
2. Land Use Plan for Black Hawk County, 1967; contained in 4 volumes
   - Land Use Plan
   - Waterloo Metro Area Transportation Study
   - Socio Economic Study
   - Implementing the Plan
3. The Plan Update for Black Hawk County, 1973
4. Parks & Open Spaces for Black Hawk County, 1966
5. Areawide Comprehensive Sanitary Sewer Study, 1973
6. Water Supply-Sewage Disposal (A comprehensive study), 1969
7. Cedar River Flood Plain Information, 1970
8. Black Hawk Creek Flood Plain Information, 1968

Bremer County

1. Comprehensive Plan, Bremer County, 1963
2. Zoning and Subdivision Ordinance, Bremer County, 1963
3. A Comprehensive Water and Sewer Study and Supplement to the Comprehensive Plan, Bremer County, 1969
4. Preliminary Park, Recreation and Open Space Plan, Bremer County, 1972
5. Appraisal of Outdoor Recreation Development, Bremer County, 1971

IOWA (continued)

Butler County

1. Butler County Comprehensive Water-Sewer Plan, 1969

Cedar County

1. Cedar County Wildlife Inventory, 1973
2. Cedar County Recreation Appraisal, 1970
3. Cedar County Comprehensive Water & Sewer Plan, 1970
4. Cedar County Zoning Study, 1958
5. Tipton Comprehensive Plan, 1968
6. Cedar County Data for Extension Planning Project and Long-Time Program Planning with Positive Goals, 1961

Cerro Gordo County

1. Cerro Gordo County Comprehensive Dev. Plan
2. Cerro Gordo County Outdoor Recreation Plan and Parks and Recreation Plan (combined)
3. Mason City Comprehensive Plan, 1965

Des Moines County

1. Comprehensive Water & Sewer Plan for Des Moines County
2. Comprehensive Outdoor Recreation Report
3. Comprehensive Plan, City of Burlington (1959-60 being updated now)
4. Water & Sewer Plan, Burlington

Floyd County

1. Zoning Regulations, Unincorporated Territory, Floyd County, Iowa, June 2, 1967
2. Comprehensive Water & Sewer Plan for Floyd County, November 1968
3. A Comprehensive Plan Report for Charles City, Iowa, 1969
4. Zoning Ordinances of the City of Charles City, Iowa, November 1970
5. Subdivisions Regulations of the City of Charles City, Iowa, December 1970

Appendix G-1 (Continued)

IOWA (continued)

Franklin County

1. Comprehensive Water & Sewer Plan
2. Guide Plan for Franklin County Region (covers both city and country side)
3. Zoning Ordinance - Franklin County
4. Subdivision Regulations - Franklin County
5. Recreation Potential Study for Franklin County
6. Franklin County Conservation Board Five Year Plan

Grundy County

1. Grundy County Zoning Comprehensive Plan
2. Comprehensive Plan, Grundy County (sewer, water, etc.)

Hancock County

1. Hancock County Outdoor Recreation Plan, 1967
2. Comprehensive Water & Sewer Plan

Hardin County

1. Hardin County Comprehensive Water and Sewer Plan, 1968. The report can be found at the Hardin County Courthouse, Eldora, Iowa, Board of Supervisors.
2. Zoning Regulations - Hardin County, November 1964, report at Hardin County Courthouse, Eldora, Zoning Commission.
3. Outdoor Recreation Plan - Hardin County, May 1969, report at Hardin County Courthouse, Hardin County Conservation Board
4. Hardin County Five-Year Transportation Plan, Continually Updated, report at Hardin County Courthouse, Hardin County Engineer

Iowa County

1. Iowa County Comprehensive Planning Report, July 1973, Filed at Iowa County Courthouse, Marengo, Iowa
2. A Guide for Development of Water and Sewerage System in Iowa County, Iowa - Prepared in 1969 - A report is in the Iowa County SCD Office, Williamsburg, Iowa
3. Iowa County Outdoor Recreation Potential, 1967, Copies in the District Office

IOWA (continued)

Johnson County

1. Regional Planning Commission
   Johnson County Regional Plan
   Part 1 - Regional Land Use and Zoning Plan, 1970 (not officially adopted)
   Part 2 - Water and Sewer Facilities Plan, 1970
   Part 3 - Parks, Recreation and Open Space, 1970
   Interim Report on Rural Land Use in Johnson County, 1973
   Preliminary Land Use Plan for Metropolitan Area of Johnson County, 1973
2. City of Iowa City
   Comprehensive Plan, 1961
3. City of Coralville
   Comprehensive Plan, Latest Revision, 1970
4. Town of Solon
   Comprehensive Plan, 1972

Keokuk County

1. Potential for Outdoor Recreation (Keokuk Co.), 1971
2. Comprehensive Water and Sewer Plan for Keokuk Co., 1970

Linn County

1. Linn County Population & Employment Analysis & Trend, 1995
2. Future Land Use Policy Plan Metropolitan Area
3. Open Space & Outdoor Recreation Plan
4. Metropolitan Utility Plan
5. Comprehensive Sewer and Water Plan
6. 1990 Transportation Plan
7. Financial Resource & Capital Improvement
8. Model Zoning Code
9. Model Subdivision Regulations
10. Summary Report - Social Economic Information
11. Solid Waste Disposal Plan
12. Initial Housing Element
13. Mass Transit Technical Study
14. Airport Authority Study

Appendix G-1 (Continued)

IOWA (continued)

Louisa County

1. Comprehensive County Water and Sewer Plan, Louisa County Board of Supervisors, 1968
2. Plan for Outdoor Recreation and Open Space, Louisa County, Louisa County Board of Supervisors, 1969
3. Comprehensive Development Plan, Louisa County, Louisa County Board of Supervisors, 1970

Marshall County

1. Parks & Open Space Plan for Marshalltown, Dec. 1972
2. Comprehensive Development Plan, Marshalltown, 1965
3. Marshall County Solid Waste Disposal Plan, Nov. 1972
4. Four County Regional Planning Group, involving Marshall, Hardin, Tama and Poweshiek Counties (In development stage)
5. Appraisal of Potentials for Outdoor Recreation Development, Marshall County, 1970
6. Comprehensive Water & Sewer Plan

Mitchell County

1. Comprehensive Water and Sewer Plan, Mitchell County, 1968
2. Mitchell County Park and Recreation Plan, 1970

Muscatine County

1. Mississippi River - Flood Plain Information Rock Island, Ill., Scott & Muscatine Counties, Iowa, (Auditor's Office), 1969
2. Comprehensive Plan of Water & Sewage Development for Muscatine County, Iowa, 1968-69 (County Board of Supervisors)
3. Park, Recreation & Open Space Plan for Muscatine County (Muscatine County Conservation Board), 1966 & 1971
4. Muscatine County, Iowa Zoning Study, Land Use Study, Comprehensive Planning - Suggested Zone Plan, Oct. 1958 (Muscatine Courthouse)
5. Regional Solid Waste Management Plan by Stanley's for City and County, June 1972 (City Hall, Muscatine)
6. Weed Park - Long Range Development, March 1967 (Muscatine Park Board)

IOWA (continued)

Poweshiek County

1. Appraisal of Potentials for Outdoor Recreation Development - Poweshiek County, 1971 (Available in field office)
2. Comprehensive Water and Sewer Plan for Poweshiek County, 1971 (copy available in field office)

Scott County

1. Solid Waste Management Plan for Scott & Rock Island Counties
2. Metropolitan Comprehensive Planning Study on: (a) water, (b) sewage, and (c) solid waste.
3. Urban Area Transportation Study (72-76)
4. Duck Creek Flood Plan Report
5. Mississippi River Flood Plain Information Report by Corps. of Engineers
6. Outdoor Recreation and Open Space I & E for Quad-City Area (draft report only as of this date)

Story County

1. Outdoor Recreation Plan for Story County, Iowa, Sept. 1969
2. A Comprehensive Water and Sewer Plan for Story County, Iowa, 1968
3. Zoning Ordinance No. 3 of Story County, Iowa, 1967

Tama County

1. Tama County Potential for Recreation Development, June 1971
2. Comprehensive Plan for Sewer and Water System Plan for Tama County, Iowa, Oct. 1968

Washington County

1. Washington County Comprehensive County Water and Sewer Plan, 2/5/70
2. Comprehensive Development Plan, Washington, 4/71
3. Comprehensive Recreation Plan, Washington County (to be printed in 1974)
4. Town of Wellman Comprehensive Plan, 5/31/67
5. Town of Kalona Comprehensive Plan

Appendix G-1 (Continued)

IOWA (continued)

Winnebago County

1. Winnebago County, Iowa Comprehensive Study
2. Forest City Comprehensive Plan, 1964
3. Five Year Comprehensive, Winnebago County Recreation Plan
4. Comprehensive Water & Sewer Plan

Worth County

1. Comprehensive Water and Sewer Plan for Worth County, March 1969
2. Outdoor Recreation, Worth County, Iowa, 1/68, revised 1972

Wright County

1. Storm Water Collection System Preliminary Report A.E.I. #6082, Town of Belmond, to be installed summer of 1974
2. Belmond Country Golf
3. Belmond, Iowa, River Park
4. Clairmond Country Club (reworked complete 9-hole course)
5. Comprehensive Water & Sewer Plan, 1968